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# GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CLXI. No. 3112.] LONDON, JANUARY 8, 1923. [75th Year. Price 1s.



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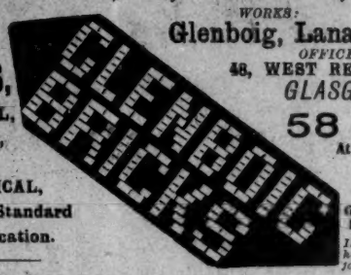


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VOL. CLXI., No. 3112.] WEDNESDAY, JANUARY 3, 1923. [75TH YEAR.


## EDITORIAL NOTES.

### The New Year.

WHAT of the New Year? The prophets are divided between optimism and pessimism; but the general tendency is to look on the cheerful side of things. The minority who are pessimistic pore gloomily over the stupendous character of our national financial obligations, and the high percentage of unemployed, which in the total makes a large army. The facts are hard; but pessimism will not help to mitigate them. The only possible and certain course of alleviation is the improvement of industry and trade, which, in the present depressed state of affairs, have a large margin of unemployed resources, including working capital, which is one of the causes of money appearing to be plentiful for investment in gilt-edged securities.

The gas industry naturally wants to see a general revival of industrial prosperity. Its own prosperity is interrelated with that of other industries. The degree of their activity is not only reflected in the consumption of gas, but in the demand for coke and other secondary products. At the same time, making allowance for the conditions of industry, the amount of unemployment, and the cost of materials, especially coal, the gas industry taken as a whole is not doing badly at the present time. It is obvious that this is not all due to the business that is being done at the existing prices of gas; for these prices, in the major part of the business, have not in them the percentage increase of costs over 1914 which current prices of materials and labour represent. In this connection, there is a proneness to overlook the contribution to the general position of the economies that are being effected by the greater thermal production as gas per unit of manufacturing materials utilized and per man, as well as the improved economies and service in distribution departments by better organization and higher efficiency. These factors should not be bye-passed in apportioning credit for the advance in position. The improvement, with outside conditions as they are, places the industry in a strong condition to meet the materialization of the predicted increased activity in industry and trading. This greater activity will supply scope for additional business by the gas industry, so that the prospects in respect of still brighter days for gas undertakings can be regarded as reasonably fair. But there must be preparation for it; and in the matter of making preparation, the industry has not been for some years past in better case than now. Market values of gas stocks and shares may not have completely recovered their pre-war places; but they have nearly done so. Gas dividends have again reached an attractive level; and there is greater security in them through the means of revision of standard prices with which the Gas Regulation Act endowed the industry. The principle has been statutorily recognized that, under the sliding-scale, standard prices must be subject to amendment with substantial changes in economic conditions. That is a safeguard to investors, as well as to gas consumers. Money is now more readily obtained, and on easier terms, than even two years ago; and so in preparation for larger business, plant extensions need not be delayed on the ground of the non-availability of money on reasonable terms. Materials and labour, and therefore plant, are cheaper to-day than when money was hard to get, and what could be obtained had a fairly high rate of interest attached to it. That again is a better circumstance. The plant contractors and manufacturers associated with the gas industry are in the position that, to keep their works and men better employed, they require more contracts. Therefore the conditions are, comparatively with almost recent times, good for making provision on a prudent scale for enlarged business.

There are other favourable factors in the situation which throw light on the prospects of, and ability to meet, increased business. They are well known. Coal and oil are lower in prices than twelve months ago; and the efficiency of their use is increasing by the adoption of modern methods of utilization. Good evidence of a wise policy is found in the purchase of the better classes of gas-making coals; but there must be watchfulness to ascertain that this does not go on to an extent sufficient to turn the balance of advantage to dis advantage. But the tendency and the fact are a benefit not only to the primary product of the gas industry, but to the secondary products. It assists especially to make coke economically more valuable to the users; and this must appreciate demand and value relatively to what it would be with quality inferior by reason of less suitable physical characteristics, resulting in excessive labour-entailing clinker and ash. The prices of crude tar and pitch, if not of all tar products, have risen compared with twelve months since. The future position in this connection cannot be predicted; but anyway the prospects of the immediate future are sufficient to cause cheerfulness. This is partly due to a shortage in output, owing in a measure to the slowness with which coke-ovens have been returning into commission. But in the iron and steel industries there have latterly been growing borrowings for business purposes; and the demand for the products of those industries is at last well on the upward road. With this condition, the expected is that more bye-product coke-ovens will be brought into operation, and there will be full-time working, with the result that the supply of tar and other products will be increased, against which may be placed the greater demand for them with the revival of industry. For sulphate of ammonia, too, there is anticipation of a larger demand in the New Year; and the home price is higher now than it has been for some months. For January and February, it is £16 18s. delivered, neutral quality, in fine friable condition, on the basis of 25¾ p.ct. ammonia. With this product, it will not do to look too far ahead; but the current position is much better than it was. Above all, the prices of gas per therm have been rapidly reduced during the last few months; and the more this movement can be conveniently speeded, the better for the development of business.

This all reads fairly optimistically as to the future—the immediate future rather than the distant; but it reflects our feelings, having regard to the conditions and foreshadowings. Of course, current conditions are not all rosy relatively to those that existed before the international catastrophe of 1914. Costs are heavier; and with all other industries and individuals, the gas industry is suffering from abnormal taxation. But in the circumstances of the times—not forgetting the growth of internal economies in gas production and utilization—the outlook is brighter than it has been, at any rate, over the last septenary period. So we enter upon 1923 with greater hopefulness than has been the case for some time past.

### Coke-Oven Gas for Town Supply.

THE Wales and Monmouthshire Junior Gas Association had quite an interesting time when they recently visited the Maritime Coke-Ovens of the Great Western Colliery Company. Probably several of the visitors for the first time came into close contact with the new economic development in gas supply of taking surplus gas from coking plant for town purposes. Of about 50 p.ct. of the gas produced

at the ovens, the Pontypridd District Council are the purchasers for town use, instead of operating their own plant—the minimum quantity to be taken annually, under a ten years' contract, being 100 million cubic feet, and the maximum 150 millions. The agreement between the parties is regarded as a good one; and the Gas Department, the Engineer and Manager (Mr. D. Muir) is satisfied, are amply safeguarded under it. They are equally as well protected as are gas consumers under the therm system, for it is upon that basis that the District Council decided to purchase, for the purpose of ensuring that the Gas Department had full value for the money paid. Another effect at which Mr. Muir hints (and which applies equally to gas undertakings dealing with the public on the therm system) is that selling and buying on this basis undoubtedly results in the Colliery Company supplying a very constant quality of gas. The gas averages 493 B.Th.U. gross.

There is an instructive experience here regarding gas measurement and transmission; but it would be useful if close comparative records for a period could be published as to the measurements—volumetric and calorimetric—of the gas before it left its place of production, and after it reached the Treforest Gas-Works at Pontypridd. At the coke-oven plant, the gas is measured by a Thomas electric meter; at the gas-works, by the ordinary station meter. At both ends, Simmance-Abady total heat calorimeters are used. The gas is transmitted at (we gather) 10 lbs. pressure through a welded 4-in. steel main; and then at the gas-works it is governed down to 8 in. before passing through the purifiers and the station meter. In the purifiers the temperature of the gas has to be raised; and this is done by steam-pipes running round the purifiers. Now with all these changes in the circumstances of the gas after leaving the coke-ovens, it is stated that there is a very close coincidence between the measurements of the electric meter and the station meter—after passing 5½ million cubic feet of gas, the difference between the two meters was only 100 c.ft. In view of what has been already stated, the question is prompted as to whether there is any difference in pressure and temperature of the gas at the coke-oven end from those at the Treforest works end; as if so, correction for this might show that the actual difference between the measurements of the two instruments was larger than is represented. This is only a suggestion, and not in any way an assertion. Then in view of the 10 lbs. pressure at which the gas is transmitted for 2¼ miles through the 4-in. main, do the calorimetric measurements at the coke-oven plant end and the works end show any differences in calorific value per cubic foot of gas? It would be interesting to have some comparative figures regarding this. It will be noticed that Mr. Muir finds that, with the introduction of coke-oven gas, the managerial duties do not diminish, but they rather increase, for a works of the size of those at Pontypridd. Constant checks have to be made to safeguard the department; and the works plant has to be kept in condition in case some emergency requires it.

## Mond Gas for Admixture with Town Gas.

THE Gas Regulation Act conferred, *inter alia*, liberties upon gas undertakings with the view of producing economies which prior enactment had denied the industry; the change being in accord with the recommendations of the Board of Fuel Research in their historic report to the Board of Trade. Through those liberties, the South Staffordshire Mond Gas Company see their opportunity for a closer union with town-gas undertakings in, and adjacent to, their district—in fact, it appears that certain undertakings have approached the Company with the object of obtaining from them a supply of gas in bulk, apparently to be used as a diluent of their ordinary gas output, in order to reduce the average cost per therm. But the Company had certain limitations placed upon them in their Act of 1901. They could only supply gas for power and heating, and not for illuminating purposes, nor could it be used for any purpose in a dwelling-house. But they are now asking through a Bill in Parliament that the provisions of the Act which limit the supply and use of Mond gas should be repealed, and that those which restrict the percentage of carbon monoxide allowable therein should be amended, and in part annulled. These alterations are necessary before any agreement can be effected with gas undertakings for the sale and purchase of Mond gas in bulk for general distribution. It is submitted that such purchase by gas undertakings will enable them to supply gas to the public more cheaply than they can otherwise do. This, of course, remains to be proved. It will largely depend upon the price paid per therm for the gas; and in ordinary gas manufacture, therm costs are being largely reduced in these days. The Bill in Parliament does not afford much leading information on this point. But it appears that the Power Gas Corporation have now a plant which will make a higher-grade gas than the customary Mond gas; and so probably it is intended to manufacture a gas of somewhat richer calorific value for supply to gas undertakings.

At any rate this seems to be the idea; for at the last meeting of the Power Gas Corporation allusion was made to a new plant for the production of "high-grade" gas for industrial and domestic purposes; and the hope was expressed that the Company would in future reap increasing advantage from this line of business. The improvements, it was also said, had been practically adapted to existing plants; and, as a result, the South Staffordshire Mond Gas Company were applying for parliamentary powers to supply gas undertakings with gas for illuminating and domestic purposes. In our "Register of Patents" to-day, there is reference to a patent (with which the Power Gas Corporation are associated) for a plant for making gas of about 170 B.Th.U. per cubic foot, as compared with the 135 B.Th.U. hitherto obtainable, while recovering the maximum yield of bye-products. It looks somewhat peculiar to see 170 B.Th.U. gas described as "high grade;" but, of course, the expression is used comparatively with other producer gas. By the process, it is claimed that it is possible to obtain a good yield of low-temperature distillation products and sulphate of ammonia, and the consumption of steam can be reduced to approximately 1 lb. or less per pound of fuel, instead of 2½ lbs. as is usual in the bye-product producer process. Connecting these pieces of information together, they point to a reason—an economic reason—for the Company considering the extension of business in the particular direction of serving as an auxiliary to town gas supply. But there the questions come in as to the price per therm, and the composition of the gas; for if the figure of 170 B.Th.U. (it is only 55 p.ct. of the calorific value of blue water gas) is indicative in this connection, it means but 1·7 therms per 1000 c.ft. On the other hand, gas of that calorific value will need a relatively small proportion of air to effect complete combustion. About this scheme there are points concerning which the gas industry will be interested in learning more. However, in the South Staffordshire Mond Gas Bill, it is noticed that the mixed gas for town supply is to have the distinctive smell of coal gas, and that nothing is to relieve gas undertakings that employ the gas from any liability or obligation under any Act or Order relating to their own supply.

## Not Playing the Game with Sulphate.

IN the recent report of the British Sulphate of Ammonia Federation, Ltd., and the address of the Chairman (Mr. D. Milne Watson) at the annual meeting, it was seen how quite a benevolent and helpful policy had been adopted in respect of British agriculture by supplying the home farmer with sulphate of ammonia at much below the export prices, and lower than the unit value of nitrogen when compared with nitrate of soda. It is only human nature to take advantage of commercial opportunities; but when prices of sulphate of ammonia are put at a low rate expressly to assist the British farmer in hard times, and to secure his permanent patronage, it is not playing the game to utilize the position for making profit other than that to be obtained from the utilization of the fertilizer direct on British soil. But this sort of thing appears to have been going on, although only described by the Federation in their December circular as "attempts." We hope it has been stopped at "attempts" by complete failure. The circular advises: "As attempts "have been made to buy supplies at the home prices, and "to resell for export, please obtain a guarantee from your "buyer that he will use the sulphate of ammonia you sell "him on his own farm." Current home prices are considerably below those for export, so that it would be rather good business to be able to buy at the former and sell at the latter. The Federation, however, are determined to do their utmost to defeat those who try to engage in these acts of circumvention. In the circular they state that the quantities bought at home prices may not be exported in any circumstances; and their contracts will now contain a

clause binding buyers to pay to them a large additional sum per ton in respect of any quantities shipped abroad. We hope this will be a deterrent, and that any offender will be caught, and made to pay the penalty of his perfidy. Bearing upon transactions of the kind, at the present time the price that the Federation can secure for the exported sulphate is an enabling factor in maintaining lower prices for home consumption; but this will not always be the case. Discretion has also to be exercised in apportioning the quantities for home use and for abroad; and if the practice grew against which protest is made and steps are being taken, it would mean that home supplies would be further restricted. The Federation mention that they are reserving the whole of their March and April production for home use; but this quantity, they say, will not be sufficient to meet the normal demand.

## Profit-Sharing in the Mining Industry.

THE wages agreement in the mining industry was discussed up and down, and turned inside out, at the delegates' conference called by the Miners' Federation just before Christmas. There was considerable hostility shown to it; but the amount of friendliness disclosed was not by any means a negligible quantity. The agreement, it will be remembered, has two capital features—a minimum wage, and a profit-sharing arrangement, whereby 83 p.ct. of any surplus goes to the miners, and 17 p.ct. to the owners, after all costs have been met. It is a good agreement; but it has been unfortunate, in that it was launched at a time when the industrial and trade depression was having, and has since had, a repressing effect upon the fortunes of the coal industry. When the agreement was originally reached, the signatories to it, on behalf of the miners (Messrs. Herbert Smith, James Robson, and Frank Hodges), referred to the guaranteed minimum wage as being of the greatest possible value to the industry. As to the remaining principles which are to govern wages and profits during the lifetime of the agreement, they said that these "mark an entirely "new departure in the mining industry; and it is our sure "belief that, when anything like normal trade returns, "these principles will provide a more just method of fixing "wages and profits than we have ever had before in the "industry." But to-day there is antagonism from those districts where the conditions are such that the minimum wage is in operation; while other districts where there is enjoyment of a percentage above the minimum, the men have adopted quite a complacent attiude in regard to the agreement—in fact, were it not for the disturbing policy of the extremists, nothing would be heard against the agreement from those areas where it is now developing as was expected. The extremists know they must get the agreement upset now, if at all; for with a boom in trade, the men would soon be tasting the sweets of profit-sharing. They would then learn that the profit-sharing part of the agreement is a really effective instrument for ensuring that they shall secure the most generous possible share of the proceeds of the industry at all times—good or bad. It also encourages the men to increase output, and so assists in reducing costs. And in some areas more than in others, the output per man has been advancing very materially. However, at the moment the low earnings of various classes of the men in certain areas are the cause of the discussion over and around the agreement; but those who would have it set aside fortunately cannot do so without a ballot of the men. In the circumstances of divided opinion as to what course to take, the whole matter has been adjourned until after Parliament reassembles. The delegates cannot afford to be so bold to-day as during the war and the difficult years succeeding.

### Parliamentary Agents and the Technical Press.

For more years than we have kept count of, the Technical Press of the gas industry has always been supplied by Parliamentary Agents with free copies of Bills and Acts which deal in whole or in part with gas undertakings. We have fully appreciated the courtesy; but, at the same time, it seems to us to be only in accord with the desire of gas undertakings generally that their special Press should receive the necessary facilities from their Parliamentary Agents for maintaining a complete record and review of the legislative work—proposed and accomplished—of the gas industry. But this year, while some Parliamentary Agents have handed us free copies of Bills for notice, others have declined to do so without payment, which is altogether contrary to the custom that has prevailed for so many years. We cannot think that this demand of the Agents for payment from the Technical Press of the industry will be supported by their clients. We therefore ask promoters of Gas Bills, or Omnibus Bills containing gas clauses, to give instructions to their Agents to continue, in the case of the Technical Press, the supply of copies free as heretofore.

### The Therm Inquiry.

The therm inquiry will be resumed next Tuesday. The National Gas Council will be submitting evidence. The Emergency Committee have given careful consideration to the position, and, on their recommendation, the Central Executive Board have invited certain witnesses to appear on behalf of the Council, which, in effect, means the industry. We take it that the three Metropolitan Gas Companies will also be giving evidence; and possibly some of the larger provincial gas undertakings. But at the moment one cannot tell exactly what will be the programme for the occasion. If the evidence is not completed on Tuesday, the Committee will in all probability meet again a week later. Anyway, there is no violent hurry in the matter. The therm is indubitably gaining more stability from the inquiry; but there are collateral matters, such as the claim for the revision of standard prices, and the form of consumers' accounts, that have been lifted to the surface. Regarding the latter matter, the rendering of accounts with the data as to cubic feet and therm consumption combined appears more prevalent than was generally known a short time ago. It will, we believe, become common practice now, even though it has no share in the Committee's recommendations. However, from the tenour of the questions put by the Chairman and members of the Committee, it looks almost safe to predict that the practice will be recommended by them as one that will serve to enlighten the public, and prevent misconception.

### Adjustment of Gas-Consuming Appliances.

According to the Gas Regulation Act, gas undertakings operating under the therm system are on a change of declared calorific power, to adjust their burners so that the gas can be consumed with safety and efficiency, unless, of course, a consumer objects to this being done. An instruction of the County Purposes Committee of the City Corporation to the Town Clerk (Sir James Bell) seems to imply a little doubt as to whether gas undertakings will voluntarily comply with this particular statutory obligation. A message from Sir James to the several departments of the Corporation states that heads of departments, or persons in charge of apparatus in which gas is consumed, should take advantage of the enactment; and in the event of any change in the declared calorific power affecting the proper working of the apparatus, application should be made to the Gas Company for the necessary inspection and adjustment.

### The Bath Therm.

Last week we asked whether any gas undertaking in the country was supplying therms at a cheaper rate than the Bath Gas Company—5½d. Up to the time of going to press, there have been no claimants for the honour; and so we suppose there is no gas undertaking that can depose the Bath Company from the position of holding at the present time a record in the matter of low price.

### The Standard Cooker.

Congratulations to the Parkinson Stove Company on their tender having secured the contract for jigs, patterns, fittings, &c., for the standard cooker, as designed by the Gas Appliances Specification Committee of the National Gas Council. It is hoped that by the middle of the year sample cookers will be available for purchase by gas undertakings who desire to inspect and test them. From this it does not appear that the standard types will be available for general buying for the coming cooker season.

### Gas Coal Position.

As customary during Christmas week, there has been very little coal business doing. Gas coals were an outstanding feature in the matter of briskness, particularly in Durham and Yorkshire.

As a result, prices generally are now very firm, at the figures at which they closed in 1922. Gas coals in other quarters are likewise in strong demand; and, giving for this the easiest of possible reasons, the market reporters are unanimous in saying this continued good demand from gas-works is due to the Christmas holidays, and the depletion of stocks. Through the position in Durham, there are greater inquiries in other quarters for gas coal for export—in Nottinghamshire, for example.

### A Mistake by the F.B.I.

The Federation of British Industries lately submitted to the Government a memorandum embodying certain points which are considered necessary for the restoration of industrial prosperity. The document covers a large area of political and other topics; and foremost is the reduction of taxation, as being imperatively essential to the purpose in view. To the points raised generally, there is little objection. But towards the end, protest is made against "a regrettable tendency to bring forward legislation regulating or restricting the operation and development of industry without laying down the principles upon which such regulation or restriction is to be exercised." It is said that instead of defining the principles, wide powers have been entrusted to administrative officials on the assumption that these powers will be reasonably and equitably exercised. As examples, the following are cited: Electricity Supply, Gas Regulation, Salmon and Freshwater Fisheries, and Smoke Abatement. The Federation are wrong in including the Gas Regulation Act. In this the principles upon which regulation or restriction is to be exercised are sufficiently defined; and therefore, so far as the Gas Regulation Act is concerned, the charge falls to the ground that wide powers have been entrusted to administrative officials on the assumption that these powers will be reasonably and equitably exercised. In respect of the Act the powers are reasonably and equitably exercised within the limits of the defined principles. The Act, too, aims (and we think successfully) at affording better facilities for the development of the industry. The Federation appear to have been somewhat misinformed in this particular.

### The Agricultural Investigation.

In the "JOURNAL" for Dec. 20, comment was made upon the proposal to set-up a Committee of Investigation to inquire into the methods adopted in other countries to secure the fullest possible use of the land for the production of food, and the employment of labour at a living wage. The producers of sulphate of ammonia should have a big interest in this investigation, as there is large scope for the increased utilization of this fertilizer at home. It was also pointed out that the Committee was to be composed of three economists connected with agriculture. The names of the selected members have now been published; and it is seen that the Government have kept rigorously to their declared intention to put the inquiry completely into the hands of economists, to the exclusion of men more directly interested in the land. We take it, however, that representatives of these will be giving evidence. The appointments are: Sir William Ashley, Professor of Commerce and Vice-Principal of the Birmingham University; Prof. W. G. S. Adams, Gladstone Professor of Political Theory and Institutions at Oxford; and Prof. D. H. M'Gregor, Drummond Professor of Political Economy at Oxford. Mr. C. S. Orwin, Director of the Institute for Research in Agricultural Economics at Oxford, has been appointed Agricultural Assessor to the tribunal, and Mr. D. B. Toye, of the Ministry of Agriculture and Fisheries, will act as Secretary.

**Examples of Good Street Lighting.**—A new issue (No. 106) of "A Thousand-and-One Uses for Gas"—obtainable at the price of 6d. post free, from the British Commercial Gas Association, No. 30, Grosvenor Gardens, S.W.—contains a series of beautiful illustrations showing the night lighting of London's most important neighbourhoods and thoroughfares—Buckingham Palace, Parliament Square, Trafalgar Square, Whitehall, Regent Street, and Victoria Street—as well as some good examples of side-street and bridge illumination. They are a remarkable testimony to the efficiency of gas for public lighting, and set up a very good standard for street lighting authorities to adopt. The fog-penetrating capacity of the gas-lamps, with their large areas of actual source of light, was particularly noticeable during the recent London smoke fogs.

## PERSONAL.

At a recent Graduation Ceremony at Leeds University, Mr. LESLIE P. INGRAM, B.Sc. (Hons.), Assistant Engineer and Chemist at the Plymouth Gas-Works, had conferred on him the degree of Master of Science.

Miss ALICE E. DUNN, daughter of the late Mr. William Dunn, of Northam, has been appointed to succeed her father as Secretary to the Northam, Appledore, and District Gas Company. Mr. ROBERT SUNLEY has been appointed Works Manager.

Mr. J. E. DIXON, the Assistant Superintendent of the Bradford Road Gas-Works, Manchester, has been appointed to the position of Manager of the Elswick Gas-Works of the Newcastle-upon-Tyne and Gateshead Gas Company, which post became vacant owing to the resignation of Mr. G. L. SWALLOW, who has been in the service of the Company for over fifty years.

The publication of the Prime Minister's New Year's Honours List has been delayed until the recommendations of the Royal Commission have been considered by a Committee of the Privy Council. Meanwhile, the Departmental Lists have been issued, and we are pleased to note therefrom that a Baronetcy has been conferred upon Bailie THOMAS PAXTON, LL.D., J.P., Lord Provost of Glasgow, who has always been so closely interested in the work of the British Commercial Gas Association, of which he was President from 1913 to 1915.

## OBITUARY.

### GEORGE THORNTON ANDREWS.

It is with regret that we have to announce that Mr. George Thornton Andrews, the Deputy-Chairman of the Swansea Gas Light Company, died at his residence, "Cefn Eithen," Swansea, on the 27th ult., at the age of 59.

Mr. Andrews had had a very long connection with the Swansea Gas Company, having for a number of years assisted his father, the late Mr. Thornton Andrews, in the management of the undertaking. For some time he was Assistant Manager; and in 1903, when his father relinquished certain of his duties, he was raised to the position of Manager. Upon his father's death in 1908, he was appointed to succeed him as Engineer, Manager, and Secretary, which position he occupied until the end of 1913. Ill-health then, unhappily, compelled him to relinquish the position, after 33 years' service with the Company, with which his father also was connected for over 50 years. In addition to receiving a retiring allowance, Mr. George Andrews was then elected a Director of the Company, who in this way continued to receive the benefit of his long experience of the undertaking. The handsome presentations made to him by the official staff and by the employees showed how greatly esteemed he was by all who had worked under him.

It will be remembered that Mr. Andrews was followed as Engineer, Manager, and Secretary of the Company by Mr. Reginald G. Clarry, who, on taking another appointment outside the industry, was succeeded in 1919 by Mr. W. H. Johns, the present holder of the position.

The death occurred on Dec. 21, at the age of 55, of Mr. RICHARD NOCK, the Manager of Newtown Gas-Works. He had been Manager under the local Council for many years. On the evening of Dec. 20 he was taken ill, and did not recover consciousness. The funeral, at which the Council were represented, took place last Monday week.

We regret to announce the death of Mr. WILLIAM DUNN, Engineer and Secretary of the Northam, Appledore, and District Gas Company. Mr. Dunn, who was 55 years of age, died suddenly on Wednesday, the 13th ult. Though he had a serious illness at the end of January last, he had so far improved during the summer and autumn that hopes were entertained of his ultimate complete recovery. Unfortunately, however, he had a sudden and unexpected relapse on Tuesday, the 12th ult., and passed peacefully away the following day. His remains were laid to rest in the churchyard of the Appledore Parish Church, in the presence of his immediate relatives and friends.

**Illuminating Engineering Society.**—At a meeting of the Society, to be held on Tuesday evening, the 16th inst., at the Royal Society of Arts, a discussion on "The Need for Suitable Training in Illuminating Engineering" will be opened by Messrs. C. E. Greenslade and J. E. S. White.

**The "Bulletin" of the British Commercial Gas Association.**—With the December number is issued as a special supplement an illustrated reprint of the lecture on "Light in its Relation to Life," which was delivered at the Bristol Conference by Sir Henry Gauvain, M.D., M.Ch., M.R.C.S., L.R.C.P. The value of this lecture for propaganda purposes is emphasized. Particulars are also announced of this year's "Fairy Gas Competition" for children, in which prizes are offered to the value of over £100. In addition, many gas undertakings are offering special prizes for local competitors.

# ELECTRICITY SUPPLY MEMORANDA.

**Prize Bungalows.**

BUNGALOWS are getting quite fashionable. Many people like them better than big labour-entailing houses. This is not to be wondered at with the changed ideas as to domestic service, and the growth of a preference for other forms of employment which gives evening freedom, and incidentally helps to swell the unemployed owing to the large surplus of candidates for work in factories and business establishments. A short time since we described an "all-gas" demonstration bungalow at Croydon [see "JOURNAL" for Nov. 1, p. 292] which had attracted thousands of the public, and since then we learn that many more thousands have passed through the rooms, and admired both the furnishing and the gas equipment. The "Daily Mail" has recently had a competition for labour-saving bungalows; but we should imagine that tenants' economy was not, in view of the award of the first and third prizes (particularly the latter), one of the essential features of the competition; though, seeing that the second prize is for what is practically an all-gas bungalow, it is clear that there was no bias on the part of the judges as to gas or electrical operation. An announcement was made as to the prize winners on Dec. 23. The winner of the first prize was Mr. Jas. M. D. Henderson, A.R.I.B.A.; the second was Mr. C. Murray Hennell, F.S.I., who collaborated with Mr. C. H. James, A.R.I.B.A.; and the third was Mr. J. S. Hodges, A.R.I.B.A. The structural and artistic merits of the bungalows do not concern us; the position of gas and electricity in them does. Even in the first prize bungalow, electricity for heating is not favoured so much as in the third prize one. But in the first and third prize bungalows, central heating, with radiators, is the main method of warming the rooms. Very wisely, Mr. Henderson, in his bungalow, introduces a gas water-heater, "so that a hot bath can be obtained at any moment." On the other hand, while the heating is by radiators fed from the kitchen boilers, the reception and bed rooms are fitted with power plugs for electric fires. From the brief description, it looks as though the first prize winner prefers the old coal range in the kitchen, though the meagre details would not justify any definite assertion as to this. The second prize winners prefer cooking by means of gas—using a cooker of the latest pattern, with taps in front and enamelled sides. The hot-water supply is provided by a Wright's "B.Th.U." gas-boiler, fitted with a thermostat valve. For the living-room and No. 1 bedroom, a Teale gas-or-coal interior is proposed, so that the use of gas or coal is optional. When the gas-fire is not in use, a gas-torch can be employed for igniting the coal fire. In a second bedroom a gas-fire is fitted. In the third bungalow, a "Sentry" duplex boiler is proposed for heating with radiators. The fireplaces are fitted with electric fires, which apparently are only for use when greater heat and comfort are required,—combined (we would add) with additional expense. An electric-cooker comes into the equipment; and electric lighting and power plugs are plentifully provided. A point under the dining-room table is suggested for lighting and power. One thing is particularly noticeable in the schemes of these architect prize winners—that not one of them relies mainly upon electrical energy for heating purposes. They know something; but to the extent that they do have recourse to electricity for heating, they do not study the tenant's economy. Labour-saving on the most economical lines should be the study of the architect—not labour-saving on the most expensive lines. The second prize winners ought, in our opinion, from this point of view, to have had the first prize.

**Electrical Contractors and Municipal Trading.**

There are times when one has to do a thing for expediency, and not because it is the course one would take in the ordinary run of affairs. The Sheffield Corporation Electricity Supply Department were in that position in relation to the stimulation of trade in electricity consuming devices; and we have here an illustration of one of the drawbacks of municipal trading which enters into direct competition with local tradesmen. The Sheffield Corporation had certain limitations placed upon them, by section 214 of their Act of 1918, in respect of trading in electrical appliances. They were only allowed freedom up to the ceiling rose; beyond that, the electrical contractors were to be the trading "cocks of the walk." The ceiling rose, then, was the terminal at which the Electricity Department's trading activities in respect of fittings and appliances were to cease; and from that point the interests of the Corporation and the contractors in respect of the promotion of business in electric apparatus, though identical in one respect, were hostile to one another. The contractors wanted the profit on the appliances; the Corporation desired the maximum custom for electrical energy. The contractors, on the other hand, are in an inferior position to the Corporation in the matter of the promotion of the sale of electric apparatus. Neither individually nor collectively could they, nor would they, carry the burden of attractive show and demonstration rooms. Yet they wished to retain the business for—and the profits on—electrical appliances. There was therefore nothing to be done, in face of the forbidding clause in the Act of Parliament, but for the Corporation to come to some agreement in the nature of a compromise with the contractors through the Electrical Contractors' Association. The Corporation had no option; and so this has been done. Whether the agreement is *ultra vires*, or whether a contractor who is not a member of the Association could have it set aside, is not definitely known. The scheme adopted by the parties is simply this: The Corporation are to provide and maintain a show and demonstration room for electrical fittings and apparatus of any description; but there are to be no sale transactions except through a contractor. The profits accruing are to be paid over to the Association, save such a sum as represents 15 p.ct. of the selling price of the fittings, lamps, or apparatus—this percentage being intended to cover the cost of equipping and maintaining the fittings proportion of the showroom. The Association, or any of the members in the district, may purchase from the showroom any apparatus, fittings, or lamps which they may require for an installation to be connected with the Sheffield mains; and such apparatus or fittings are to be supplied to the contractors at a discount not exceeding 25 p.ct. of the selling price. The collection of the moneys accruing from the sales is an obligation on the Corporation, who are to keep separate accounts of all transactions covering purchases and sales. The Electricity Department do not like the scheme; the electrical contractors appear to be the chief beneficiaries. The purchasers of the appliances are the ones who will have to pay for the support of the equipment of the show and demonstration room, and supply the contractors with their profit on the sales. The equipment, it seems to us, must not become a charge upon the general supply or the rates; otherwise we imagine any electricity consumer or ratepayer would be able to raise objections to the agreement. And the unfortunate thing for the Department is that electric appliances and fittings are already so costly, that this roundabout way of doing business with double handling must have the effect of running-up the cost to the purchaser. The Association have agreed—and this points to the agreement being *ultra vires*—so long as the arrangement remains in force, not directly or indirectly to take proceedings or support proceedings against the Corporation for, or in respect of, any alleged breach of the limitations as regards trading imposed by the Act of 1918. The agreement is to continue for a period of five years from March 31 next, and thereafter from year to year, subject to six months' notice from either side to expire on March 31 in any year.

**More Propaganda Needed.**

There seems to be some dissatisfaction abroad in the electricity industry regarding the fruits of its propaganda work. This is not altogether a compliment to those who handle propaganda for the industry; and yet we are not prepared to assert that the fault is theirs. The best and fullest propaganda may not persuade the public that all is as represented; it may not be the propaganda that is at fault, but the costs and performances of the appliances the adoption of which the propaganda is intended to speed-up. In the "Commercial Development" section of the "Electrical Times," an article recently appeared on "The Exhibition Problem." It opens by emphasizing the "undoubted fact" that "there exists a great need for more and still more propaganda to educate the public regarding the possibilities and utility of electricity." Propaganda is always needed in every business—particularly in a business subjected to active competition. The lack of knowledge on the part of the public, the writer holds, is not entirely due to "the lack of enterprise on the part of the supply authority, the manufacturer, or the contractor; it is in reality due to lack of breadth of vision." We agree. Lack of breadth of vision on whose part? Advertisements, exhibitions, and other items in the propaganda system are all requisite. But what good are advertisements that appear in public prints to disseminate knowledge when many of the statements in them are altogether hostile to public experience? What good, too, are exhibitions in impressing the public when little exact information concerning the appliances on view can be obtained about them, when the information procurable is either sufficient to frighten the inquirer, or is contrary to the experience that he himself or some friend has had? We know of an electric light user in South London who before the war saw an electric radiator at an exhibition, and bought one on the representations of the attendant at the stand. His wife was taken ill, and spent five weeks in her bedroom. The electricity account for that radiator resulted in its prompt abandonment; and, in a very large circle of friends of that householder, not a single electric radiator has since been adopted. However, the writer of the article advocates more intensive propaganda, so as to produce repeated public impression. But this is met by the parties interested haggling over who should bear the expense, or, if a co-operative plan, as to how the costs should be apportioned. Between the manufacturers, too, there is difficulty as to agreement regarding the types of appliances to be exhibited. So propaganda suffers. What the writer of the article advocates, is a collective exhibit where intelligent information can be obtained from the attendants, and literature be freely distributed. Live exhibits, too, are preferred. An appeal is made for united support for such form of propaganda. But the whole tenour of the article breathes of dissatisfaction over the harvest so far reaped from the sowing; hence the idea that intensified propaganda will accelerate business. Our view is that it is not propaganda, but something else—something inherent to electrical operation—that has to do with the slow progress. And, furthermore, electrical operation must take its place in the competition on a commercial basis. That i the only basis the public understands.

**Heating and Cooking Costs.**

When referring, on Dec. 20, to the discussion on Mr. W. A. Gillott's paper, mention was made of the declaration of Mr. P. M. Baker that it was still cheaper to cook by coal and gas than by electricity. It was also stated that "Noes" were hurled at him from different parts of the hall. But "Noes" constitute a poor and nebulous form of argument. Either Mr. Baker is right or he is wrong; and the means of proof one way or the other are not beyond reach. Since, however, that gentleman made his fearless assertion, no one has come forward with anything to disprove it; but he has since published, in "Electrical Industries," a further reference to the subject. He adheres to the view that a heating or cooking load is necessarily a difficult proposition from the central-station point of view; for not only is it far from simple to burn fuel in a generating station, and to distribute heat units electrically with an efficiency equal to that of a coal-burning range in good condition and well handled, but it is also very difficult to persuade any householder to incur the expense of replacing a coal range or a gas-stove, which is already installed, unless he can see a very considerable monetary advantage in so doing. Mr. Baker, however, does not desire to damp the ardour of those supply authorities who think there is much for them in this heating and cooking business. He tells them that it does not follow from what he has said that they should take a gloomy view of the situation, but that they should carefully examine the possibilities—remembering that expansion of the domestic load calls for: (*a*) The highest possible efficiency of generation and distribution; (*b*) a most carefully considered tariff; and (*c*) some method, such as hiring, to overcome the consumer's reluctance to lay-out capital on appliances which will probably be useless if he moves into another area. Although many supply authorities sell their units for off-peak loads at very special prices, and are meeting with considerable success therewith in consequence, he thinks that in many areas the cost to the consumer renders electric cooking quite prohibitive, especially in artizans' dwellings. Mr. Baker ventures to suggest that frank criticism and the raising of difficulties stimulate progress rather than the reverse, and that, if his remarks produce further papers demonstrating the superiority of electrical equipment over the coal cart or the gas-main for distributing heat units to the community, they will have served a useful purpose. We shall look with interest for the demonstration. Will it come? To revert to the factors that call for consideration, the highest known possible efficiency in generation leaves, in point of cost, electrical B.Th.U. far behind other forms of supplying potential heat. As to tariffs, these have been under careful consideration since the advent of uses other than lighting; and with all the invention in this direction, the universally acceptable tariff has not yet been discovered. The consumer's reluctance to lay-out capital on an electric cooker is due partly to its high initial cost, and partly to the lower initial costs of another means of cooking. Electricity undertakings, too, through the same high expense are not highly enamoured of laying-out much capital on stoves for hire; that high expense means that fairly heavy rentals have to be levied so as satisfactorily to cover capital and maintenance charges.

## The "Practical Engineer" Mechanical Pocket-Book.

This pocket-book and diary is sufficiently well-known to engineers of every branch to need little introduction to our readers. We have to acknowledge the receipt of the 1923 edition, which is published by Henry Frowde and Hodder and Stoughton, of Bedford Street, W.C. 2. One difficulty in compiling any text-book is that some parts are bound to be out-of-date by the time the book reaches the public; and this disability is likely to be magnified in the case of a yearly hand-book. But great trouble appears to have been taken in revising and supplementing the mass of information contained in this thirty-fifth edition of the "Practical Engineer." The gas industry for once has to acknowledge recognition as something very live; we quote from the preface: "Having regard to the rapidly increasing importance of gas for industrial purposes, the notes on this subject have been rewritten." These notes constitute Section XV. of the book—Gas for Heating, Lighting, and Power. Gas-heated furnaces, as concerning most among gas appliances the mechanical engineer, receive a fairly comprehensive treatment; principles of design and special features for various uses being discussed in connection with illustrations of sundry types. Notes on gas-piping include a diagram for the determination of discharge through various lengths and sizes of pipe; and helpful details are given as to jointing and metering. Factory lighting is nowadays receiving its due share of attention; and the gas section of the book contains abbreviated explanations and notes on the subject in the light of modern knowledge. General and local lighting are dealt with, and high-pressure gas is given a couple of pages. The diary included at the end of the text should encourage the use of the book as veritable "*vade mecum*." Its price in cloth is 2s. 6d., and in Pluviusine 3s. net.

**Manchester and District Junior Gas Association.**—There is to be a visit by members to the Nelson Gas-Works, at Brierfield, on Saturday afternoon, the 13th inst. After the inspection, and tea provided by the Gas Committee, Mr. E. Burke, of Accrington, will read a paper on "Public Lighting."

## A CONCISE EXPLANATION OF LORD BIRKENHEAD'S ACT (THE LAW OF PROPERTY ACT, 1922).*

As might be expected from so accomplished a lawyer and charming a writer as Sir Arthur Underhill, this book is a model of clearness and information. It deals with an epoch-making piece of legislation—the Law of Property Act, 1922, which will affect the interest of everybody. The subject to which the Act relates is of particular importance to readers of the "JOURNAL," because they are for the most part interested in the descent and transfer of land and real property, not only in their personal capacity, but also as persons charged with the direction of statutory and other large undertakings. To these, any alteration in the law of real property cannot fail to be of vital importance; and we can strongly recommend to them the work now reviewed.

The fundamental objects of the Act—which Sir Arthur Underhill's book explains so concisely—are to assimilate the law relating to real and personal property, to facilitate the transfer of land and other real property by conveyance or will, and by simplification to render dealings in land as easy as dealings in goods, regard being had to their essential differences.

It is no doubt common knowledge that the law relating to land is a cumbrous survival of feudal times, patched here and there and from century to century, and presenting to-day a medley of complications formidable to everyone, even including the inhabitants of Lincoln's Inn. It therefore follows that when it is desired to sell, purchase, or mortgage land, a complicated investigation is necessary of the thousand-and-one interests which may exist at the same time—a process termed "investigating title"; while the demisal of land by will is, as everyone knows, a tremendous business, resulting in the production of a will which no one understands except the family lawyer—and he has all too frequently to have recourse to "Counsel's Opinion." It will also be common knowledge that there are several kinds of estate in land—as, for example, freehold and copyhold—and very many customs governing descent.

Sir Arthur Underhill's book explains in the manner following how the Act carries out the objects for which it was passed. Chapter I. contains an historical sketch of the present law of real property, showing why it is unnecessarily complicated and archaic. Chapter II. summarizes the provisions of the Act intended to simplify the law. Chapter III. summarizes the provisions of the Act intended to facilitate land transfer directly.

It is not our present purpose to discuss at all the many points with which the Act deals and which the book explains; but we refer to two or three matters only, merely to illustrate the general importance of the change in the law which the Act will effect.

A completely new code is set up relating to the devolution of both real and personal property on intestacy; and a husband and wife are placed on precisely the same terms with regard to each other's property and that of an intestate child. Copyhold tenure is abolished; and the various restrictions which that system imposed on tenants of such land will accordingly be swept away.

Many undertakings hold land which is subject to restrictive covenants arising out of old and musty conveyances, whereby the use of the land according to the desire of the holder or tenant and of modern requirements is restricted. The Act empowers official arbitrators, on a proper case being made out, to modify or discharge the restrictive covenants, and so remove the clog upon the free use of land.

The provisions of the Act are not operative at once, but come into force at various dates, to which it is not necessary to refer in this brief notice.

Finally, a word of praise is due to the publishers for the excellence of the paper and the print—employed to give to the public what, in our view, is an indispensable guide to a most important and far-reaching enactment.

* "A Concise Explanation of Lord Birkenhead's Act (The Law of Property Act, 1922) in Plain Language." By Sir Arthur Underhill, LL.D., Bencher of Lincoln's Inn, &c. London: Butterworth & Co. [Price 10s. 6d. net.]

**Birmingham's New Woodall-Duckham Plant.**—The installation at the Nechells works of the Birmingham Corporation of the new Woodall-Duckham vertical retorts is complete, and last Thursday it was formally put into operation. Similar retorts are already at the Windsor Street works, Swan Village, and the coal test works. The maximum output of the Birmingham Gas Department during the war was in the year 1918, when 13,000 million c.ft. of gas was sold. The day record was in that year, when 56 million c.ft. were distributed, though on Wednesday last week nearly 48 million c.ft. were sent out. Previously the Department was capable of making 42 million c.ft. of gas per day; but by the new installation the daily output will be greatly increased. The installation consists of 120 retorts, each capable of carbonizing 7 tons of coal, or a total of 840 tons, per day of 24 hours, giving an output of gas equal to 11½ million c.ft. a day. The new vertical retorts are built on the site of the old inclined retorts in No. 1 retort-house, and have more than doubled the capacity of the latter, though the ground space occupied is the same.

# WATER GAS.

By Dr. A. PARKER, F.I.C., Research Chemist to the Joint Committee of the University of Leeds and the Institution of Gas Engineers.

**[A Paper read before the Midland Junior Gas Association, Dec. 14.]**

Water gas is the name applied to the gaseous mixture obtained when steam is passed over incandescent carbon. The reaction was probably discovered by Fontana in 1780, since which time many processes have been devised with the object of utilizing it on a commercial scale. Perhaps one of the earliest recorded experiments in this direction was that of Ibbotson, who, in 1824, increased the volume of gas from coal by injecting steam into the red-hot coke remaining in horizontal retorts at the end of the period of carbonization; and many other similar experiments were carried out between that time and the granting of a patent in 1850 to Stephen White for improvements in the manufacture of gas. These improvements consisted essentially in the manufacture of water gas and the admixture of this gas with coal, cannel, or resin gas in the retort in which one of the last-named gases was being generated. The water gas was made by transmitting steam over ignited charcoal or coke in one retort; and this gas, together with undecomposed steam, was swept through a second retort in which coal was undergoing distillation.

White's "hydrocarbon process," as it was called, was subjected to thorough investigation by the late Sir Edward Frankland in 1851; and the results obtained by him are given in detail in his "Experimental Researches in Pure, Applied, and Physical Chemistry," published in 1877. Frankland's views regarding the sweeping action of steam and water gas on the volatile products of coal are so clearly expressed in the introduction to Section 2 of his book, and the subject is of such importance at the present time, that the following extract is given:

> The chief advantage of this process consists in the rapid removal, by the stream of water gas, of the luminiferous hydrocarbons generated in the coal or resin retort. In the common mode of gas manufacture, these luminiferous hydrocarbons are, to a considerable extent, decomposed into carbon or tar and marsh gas by contact with the heated sides and contents of the retort. But in the hydrocarbon process, the stream of water gas shortens the period of such contact, and thus prevents to that extent the destruction of the luminiferous gases.

White's hydrocarbon process was a failure, by reason of the fact, as pointed out by Frankland, that it was necessary to use iron retorts; and iron is rapidly oxidized by steam at a bright red heat, so that part of the gas was made at the expense of the material of the retort. The principle of White's process is identical with that of the present-day process of steaming in continuous vertical retorts, in which the water gas produced by the action of steam on incandescent coke in the lower sections of the retort passes upwards through the coal undergoing carbonization above. It has been possible to make steaming in continuous verticals a success, since retorts are now of refractory material instead of iron; and, further, the design and methods of operation of continuous vertical retorts have avoided many of the difficulties which accompany the process of steaming in horizontal retorts. After White invented his hydrocarbon process, several attempts were made to manufacture water gas *per se* by the continuous introduction of steam into externally heated retorts containing coke or charcoal; but for various reasons these attempts did not meet with much success.

The manufacture of water gas first became an industrial proposition in 1873, with the introduction of the intermittent system by Strong and by Lowe in America. Strong, who aimed at manufacturing blue water gas mainly for heating purposes, utilized the heat value of the "blow" gases for the purpose of superheating the steam on its way to the generator. Lowe, on the other hand, aimed at producing a gas of high illuminating value, and therefore utilized the large quantities of combustible gas produced during the "blow" period for cracking enriching oil. No real progress in the manufacture of water gas in this country was made until 1888, when a plant operating on the Lowe principle was installed at the Leeds Forge.

### THEORETICAL CONSIDERATIONS.

In order to appreciate the possibilities and limitations in the thermal efficiencies obtainable in the manufacture of water gas by the intermittent system, it is necessary to have a clear understanding of the principle reactions which take place during the blow and run periods.

*Blow Period.*

The addition of heat to the fuel bed and brickwork of the

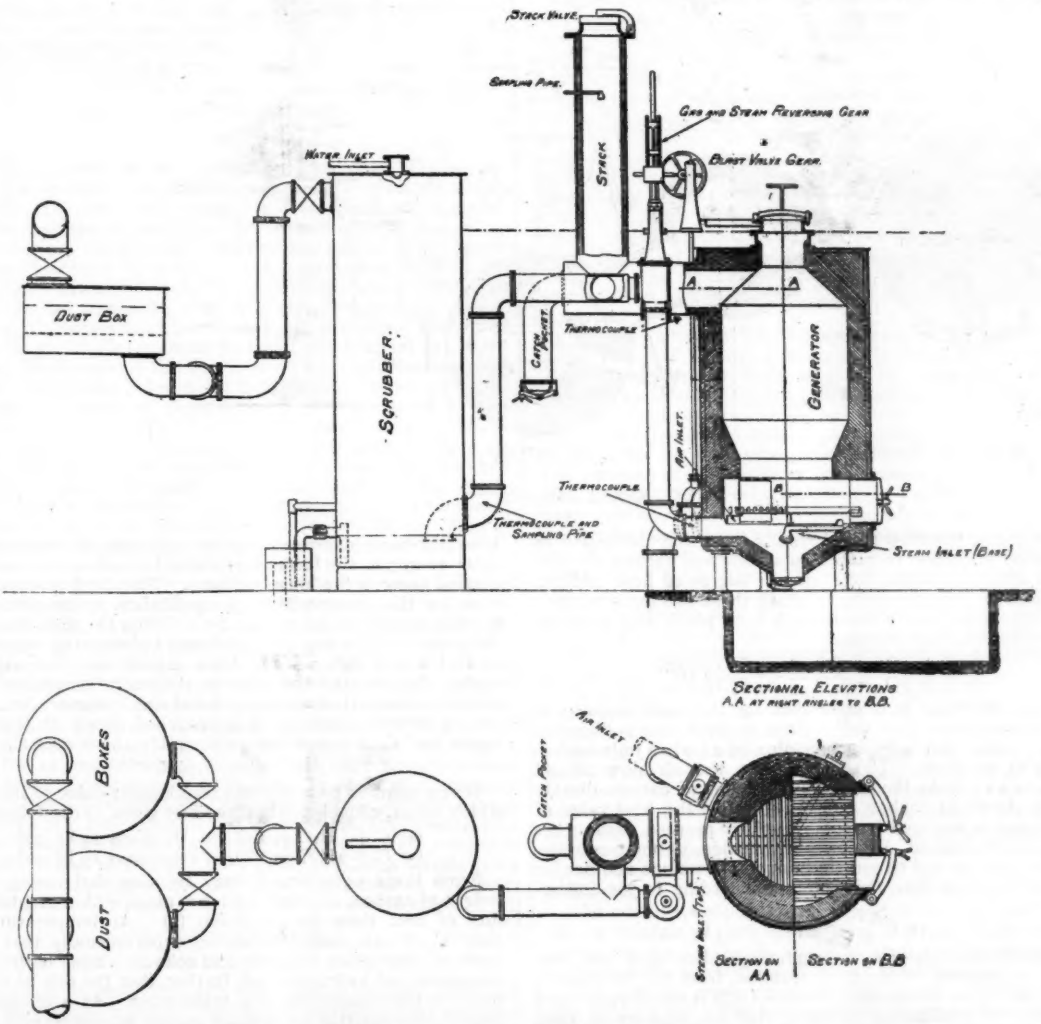
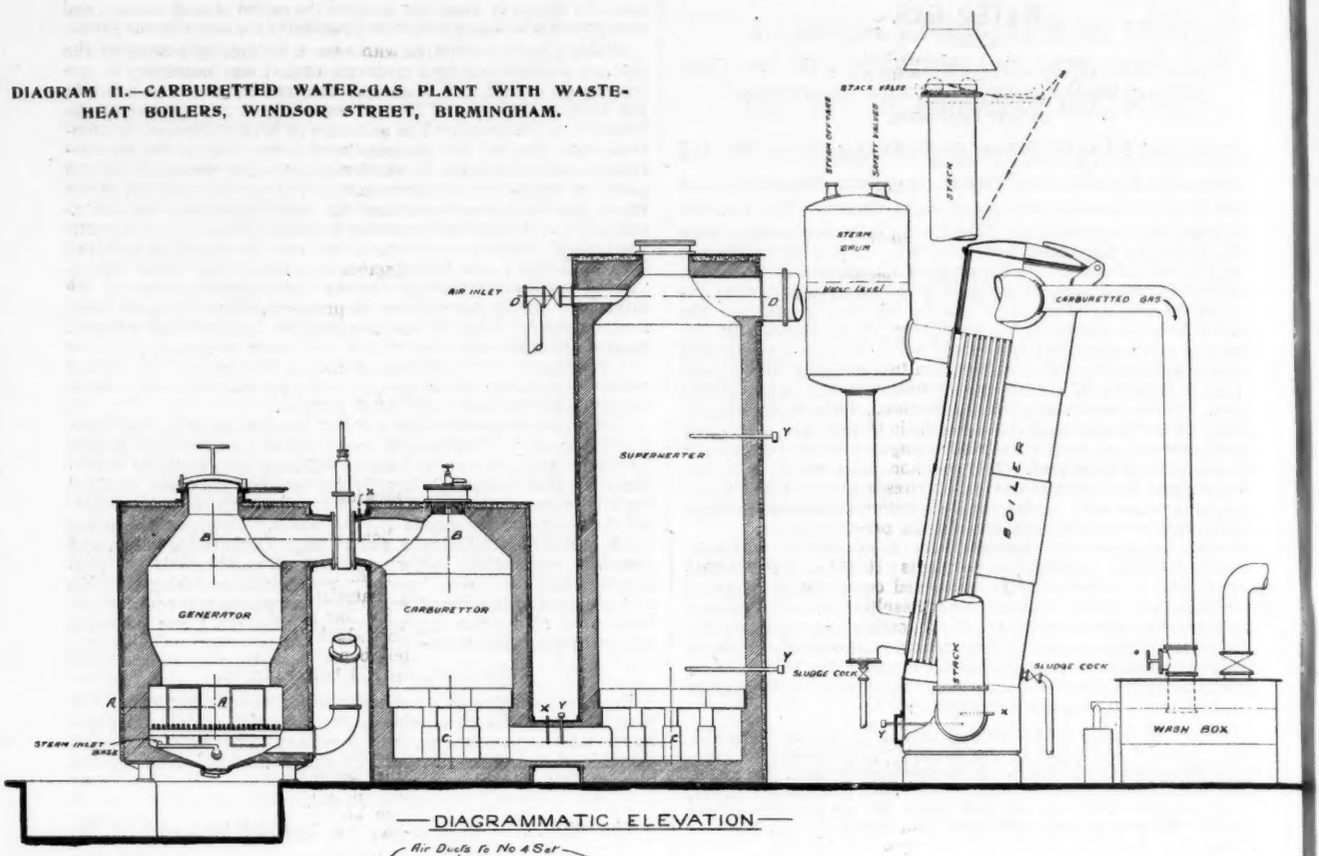
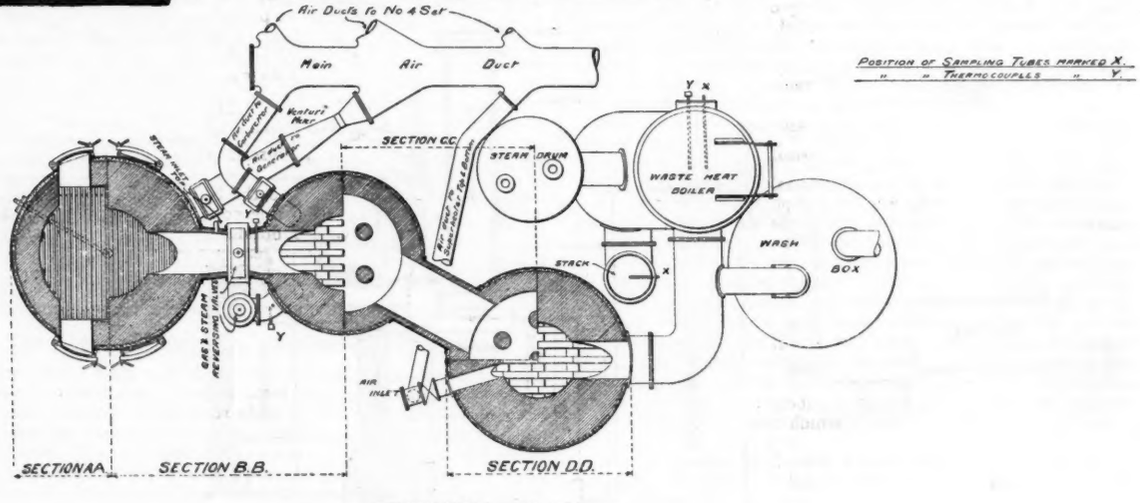



DIAGRAM I.—WATER-GAS PLANT, ADDERLEY STREET, BIRMINGHAM.

DIAGRAM II.—CARBURETTED WATER-GAS PLANT WITH WASTE-HEAT BOILERS, WINDSOR STREET, BIRMINGHAM.




—DIAGRAMMATIC ELEVATION—




—SECTIONAL PLAN—

generator during the blow period results from that developed by the oxidation of carbon to carbon monoxide and carbon dioxide; and, with other conditions the same, the degree of heat addition is dependent on the proportion in which these two gases are produced. The principal reactions which take place may be represented by the following equations:

(1) $C + O_2 = CO_2 + 97{\cdot}65$ kg.cals.
(2) $C + \frac{1}{2}O_2 = CO + 29{\cdot}65$ kg.cals.

From these equations, it is clear that for the same quantity of carbon oxidized more than three times as much heat is liberated when the product is wholly carbon dioxide as when only carbon monoxide is obtained. The aim during the air-blow should therefore be to obtain the maximum amount of carbon dioxide and the minimum of carbon monoxide, unless the heat value of the latter gas is required for some auxiliary process, such as the cracking of enriching oil. When carbon dioxide, carbon monoxide, and carbon are allowed to remain in contact with one another for a sufficient length of time, they interact according to the following equation:

(3) $C + CO_2 = 2\,CO$ *minus* 38·35 kg. cals.

until a definite position of equilibrium, dependent upon the temperature, is attained. This third reaction, from left to right, is accompanied by an absorption of heat—*i.e.*, it is *endothermic*—and the position of equilibrium changes with temperature in such manner that more carbon monoxide is produced at the higher temperatures. The efficiency of heat generation during the air-blow therefore decreases rapidly with rise of temperature, and more energy in the form of potential heat of carbon monoxide is carried away in the blast products. This third reaction requires time for the true position of equilibrium to be attained; and certain authorities claim that, by reducing the time of contact of the gases with the fuel to a minimum by means of a shallow bed of fuel and a high velocity blast, almost complete oxidation to carbon dioxide can in practice be attained at comparatively high temperatures. It should be pointed out, however, that, although the equilibrium position is approached slowly at temperatures below 800° C., it is reached very rapidly above 900° C.

*Run Period.*

When steam is passed over incandescent coke, of the reactions which occur, consideration should be given to the following:

(4) $C + H_2O = CO + H_2$ *minus* 29 kg. cals.
(5) $C + 2H_2O = CO_2 + 2H_2$ *minus* 19 kg. cals.

From these equations it may be seen that, using the same weight of carbon, reaction (4) takes place with a greater absorption of heat than does reaction (5). At temperatures above 1000° C., it can readily be shown experimentally that the products of interaction of steam and coke are almost entirely carbon monoxide and hydrogen, and, further, that the rate of reaction is rapid if the temperature be maintained. At a temperature of 600° C., the reaction takes place mainly as represented by equation (5), and only a small proportion of the steam used is decomposed. Between these temperatures, both reactions occur, the

proportion of steam decomposed and the quantity of carbon monoxide produced increasing with rise of temperature. If the gaseous products from these two reactions be kept in contact with one another at a high temperature for a sufficient time, they interact according to the equation:

$$(6)\ CO + H_2O = CO_2 + H_2$$

until a position of equilibrium is attained. The position of equilibrium is defined by the equation:

$$(7)\ K = \frac{(CO) \times (H_2O)}{(CO_2) \times (H_2)}$$

in which K is a constant for any given temperature, but increases with rise of temperature.

The following values of K at different temperatures are taken from Haber's "Thermodynamics of Technical Gas Reactions."

| Temp. °C. | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 |
|---|---|---|---|---|---|---|---|---|---|---|
| K . . . | 0·55 | 0·86 | 1·25 | 1·65 | 2·10 | 2·56 | 3·04 | 3·51 | 4·03 | 4·51 |

It is clear, therefore, that increase in temperature favours the production of carbon monoxide. It follows, also, that excess of steam must, as far as possible, be avoided, since according to equation (7) it would cause an increase in the amount of carbon dioxide. Further, it would lower the temperature of the fuel bed, and therefore the value of the reaction constant K. In the absence of a catalyct, and at temperatures below about 1300° C., the equilibrium position required by equation (7) is only attained after a comparatively long time. In the presence of a catalyst, however, equilibrium is reached more rapidly. This may be illustrated by the following experiments: If superheated steam be passed through a layer of powdered coke maintained at a given temperature—say, 750° C.—the resulting gaseous product contains a relatively high proportion of carbon dioxide (although usually less than the amount required for true water gas equilibrium). Maintaining the same experimental conditions as regards temperature, rate of supply of steam, &c., but replacing the coke by a purer form of carbon, such as retort carbon or lampblack, it will be found that the product gases contain a smaller proportion of carbon dioxide. The production of amounts of carbon dioxide nearer to those required by the equilibrium equation when coke is employed, leads to the conclusion that certain compounds (probably of iron) in the coke act as catalysts.

From the considerations just outlined, it would appear necessary, in order to obtain a good efficiency during the run period, that (*a*) excess of steam should be avoided, (*b*) the temperature of the fuel bed should be comparatively high, and (*c*) the rate of steam supply should bear such relationship to the area and depth of the fuel bed that adequate time contact of the steam with the fuel at a high temperature is allowed to ensure reasonable decomposition and a minimum of undecomposed steam.

*Blow and Run Periods.*

From consideration of the reactions taking place during the blow and run periods in the intermittent process of manufacture of water gas, it is clear that, in order to obtain high efficiency of heat addition during the air-blow, the fuel bed must be kept at a comparatively low temperature, and the time contact of the gases with the hot fuel must be small. On the other hand, in order to obtain a high efficiency during the steaming operation, it is necessary that the fuel should be kept at a high temperature, and a longer time of contact must be allowed. It is evident, therefore, that these opposing factors must be taken into account in determining the conditions for the best over-all thermal efficiency.

Strache and Jahoda ["Journ. für Gasbeleucht," 1900 and 1904], in an extensive series of papers, which are abstracted in the "Technical Record" of the "JOURNAL OF GAS LIGHTING," 1901 and 1904, described experiments in which they analyzed the conditions of blow and run affecting the total efficiency of water-gas production. From their results, they calculated that the maximum efficiency is obtained with the fuel bed at a mean temperature of 880° C., at which temperature, and *under the conditions of their experiments*, the blow gas contained 9 p.ct. of carbon dioxide and 19·8 p.ct. of carbon monoxide, and left the generator at 380° C. During the run 95 p.ct. of the steam was decomposed; and the resultant water gas, which contained 2·8 p.ct. of carbon dioxide, left the generator at 440° C. Strache and Jahoda concluded that, under these particular conditions, it is possible to obtain an efficiency of 71 p.ct. without any allowance for fuel for raising steam and driving the blower. This efficiency would become 56 p.ct. after allowing for the additional fuel required.

The research by Strache and Jahoda was undertaken in the first place as a result of Dellwik's claim that, merely by using a shallow bed of fuel and a high-velocity blast, the carbon monoxide content of the blow gas could be reduced to a very small amount. They concluded, however, that Dellwik's results were due to having the fuel bed at a low temperature, and that this low temperature had been compensated for during the run periods by a reduction in the rate of flow of steam. They found that, with certain rates of flow of steam, reasonable decomposition could be obtained, even with the fuel bed at a comparatively low temperature.

## WATER-GAS PLANTS.

*Blue Water Gas.*

The modes of operation and construction of blue water-gas plants can perhaps best be illustrated by descriptions of examples of three types—(*a*) the Lowe plant as improved by Messrs. Humphreys and Glasgow, (*b*) the Dellwik-Fleischer plant, and (*c*) the Kramer and Aarts modification. Generally speaking, a blue water-gas generator consists of a cylindrical steel chamber, lined with firebrick, and provided with a gas-tight charging device at the top and with suitable arrangements for the admission of air and steam and for the exit of blow gas and water gas. It is desirable that the steam supplied to the generator should be as dry as possible. Since the steaming is accompanied by a marked absorption of heat, causing the temperature of the fuel to fall steadily during the run, the rate of reaction rapidly decreases. It would therefore be advisable continuously to reduce the rate of supply of steam. This procedure, however, is not generally adopted in practice. Although arrangements have been made for the utilization of heat which would otherwise have been lost—*e.g.*, from the blow gases in the manufacture of carburetted water gas by the Lowe system, and from the run gases by superheating the steam as in the Dellwik-Fleischer process—little had been done in this direction prior to the introduction of waste-heat boilers during recent years.

*Humphreys and Glasgow plant.*

As an example of this type, a description is given of the blue water-gas plant at present in operation at the Adderley Street Works of the Birmingham Gas Department. This particular installation was used for the investigation into the thermal and chemical efficiencies of manufacture of blue water gas, described in the Sixth Report of the Research Sub-Committee of the Institution of Gas Engineers.

The generator (shown in horizontal and vertical sections in diagram 1) consists of a cylindrical steel shell lined with firebrick blocks, which are separated from the metal by annular spaces packed with non-conducting material. The bed of fuel (about 7 ft. in thickness) rests on a flat bar grate on a level with which are clinkering doors, and below which is a door for removing the ashes into the pit immediately beneath. The generator is connected by pipes, both above and below the fuel bed, with the bottom of the scrubber. During the blow periods, the air enters at the bottom of the generator, and the blast products travel through the outlet pipe at the top to the stack, which is controlled by a special valve. During the run periods, when the blast valve is closed, the steam enters either below or above the fuel bed, and the resultant water gas is carried away to the scrubber by the outlet pipe at the top or bottom, according to whether the steaming is being operated in an upward or downward direction.

A special catch-pocket is so placed on the top outlet pipe that it collects the heavier particles of coke carried forward during the blow period. The generator is charged with coke, from metal hopper barrows, through the door in the extreme top. The plant is manipulated from an elevated operating floor flush with the charging door, at which level all levers controlling the necessary valves are assembled. A battery of gauges, indicating at any stage of the process the pressures at different points in the plant, enables the operator to judge the working conditions throughout the apparatus. Steam meters, the indicator dials of which are also situated above the operating floor, enable the operator to regulate the steam valves to obtain the desired rate of flow of steam. An interlocking valve gear prevents the operation of the steam and blast valves except in their safe and proper order. The air to the generator is supplied by means of a Sturtevant blower driven by a 20 H.P. De Laval turbine of the non-condensing type.

From the generator, the water gas made during the run periods passes into the bottom of a scrubber through a water seal of 2¼ in. The scrubber itself consists of a cylindrical steel shell packed with circular wooden grids resting on a perforated steel plate. A rapid stream of cold water enters the scrubber at the top, is distributed by means of wooden grids, and flows out through the overflow pipes at the bottom into a separate seal. The purpose of the scrubber is to remove particles of tarry and solid matter, and at the same time to condense undecomposed steam and cool the water gas to atmospheric temperature.

After leaving the top of the scrubber, the water gas is made to pass through two cylindrical steel dust boxes in parallel. These boxes, *which are additional to the usual apparatus*, are at present being used in experiments devised with the object of removing a very troublesome dust which is ordinarily carried forward and deposited in all sections of the plant, even beyond the relief holder. As a result of these experiments, much of the trouble has already been removed.

According to the usual routine of operation at the time of the tests described in the Sixth Report of the Institution of Gas Engineers, clinkering was carried out every six hours. The generator was charged with coke to a depth of 8 ft. every 41 minutes; and the usual cycle consisted of a one-minute blow followed by a four-minute run divided into one-minute up steaming, two-and-a-half minutes down, and a half-minute up. During the last forty-minute period before clinkering, steaming was operated in an upward direction only. The purpose of the last series of all up runs was to cool the lower part of the fuel bed before clinkering.

The average compositions of the blow and run gases produced during the test carried out on this plant by the Research Committee of the University of Leeds and the Institution of Gas Engineers are given in the following table [overleaf].

The average gross calorific value of the water gas made was 301 B.Th.U. per cubic foot; and for the production of 1000 c.ft. of this gas, it was necessary to supply to the generator 43·7 lbs. of coke (dry basis), which contained 13·1 p.ct. ash.

*Compositions of Gases, Volumes per Cent.*

| — | Blow Gas. | Run Gas. |
|---|---|---|
| $CO_2$ | 12·2 | 4·25 |
| $C_mH_n$ | 0·0 | 0·05 |
| $O_2$ | 0·2 | 0·10 |
| CO | 12·8 | 41·40 |
| $H_2$ | 3·0 | 49·15 |
| $CH_4$ | 0·5 | 0·75 |
| $N_2$ | 71·3 | 4·30 |
| | 100·0 | 100·00 |

*Dellwik-Fleischer Plant.*

This plant consists of a single generator supplemented by a condenser and scrubber system. The generator is shorter than that of the Humphreys and Glasgow plant, but is much greater in diameter (being about 12 ft.), and the depth of the fuel bed is kept at approximately 3½ ft. There is thus obtained a broad shallow fuel bed, which, with a powerful air blast, is designed to promote the maximum formation of carbon dioxide during the blow period. The time allowed for the blow relative to the period of time for the run is consequently shorter than is usual with the Humphreys and Glasgow plant. In certain types of Dellwik-Fleischer plant, the sensible heat of the blue water gas is utilized to superheat the steam on its way to the generator. As a result of tests carried out on this plant, figures have been given for the compositions of the blow gases produced, showing carbon dioxide varying between 15·1 and 18·6 p.ct. The following composition is typical of results which have been obtained:

| | |
|---|---|
| $CO_2$ | 18·3 p.ct. |
| $O_2$ | 1·2 ,, |
| CO | 1·4 ,, |
| $N_2$ | 79·1 ,, |
| | 100·0 p.ct. |

The presence of so much as 1·2 p.ct. oxygen in the blow gas leads to the conclusion that, owing to the powerful blast combined with a shallow fuel bed, channelling probably took place, with the result that a certain amount of the carbon monoxide leaving the fuel bed afterwards combined with oxygen above the fuel to produce carbon dioxide before it reached the position of sampling. In such case the samples do not represent the true composition of the blow gas which would result with a properly distributed bed of fuel in which channelling did not take place. Observations of the working of a well-conducted shallow bed have frequently shown much less oxygen and more carbon monoxide. Further, the sensible heat carried away by the blow gases on this system may be considerable.

*Kramer and Aarts Plant.*

The arrangement of this plant is such as to ensure a shallow bed of fuel and a minimum time of contact of the gases during the blow, with a deep fuel bed and a comparatively long time of contact of the gases during the run. Two generators, arranged side by side, are connected together at the top by a regenerator which consists of two chequer-brick chambers. The fuel beds are blown in parallel, a high velocity blast being used. The blast products leave the generators at the top and pass through the chequer-brick chambers before entering a central stack. At the entrances to the generator, the blow gas is mixed with secondary air to complete the oxidation of any combustible gas for the purpose of heating-up the chequer brickwork to a high temperature. During the run the generators are steamed in series. The steam enters below the fuel bed of one generator; and the water gas and undecomposed steam are superheated in the regenerator before passing downwards through the second generator. In this manner some of the undecomposed steam and carbon dioxide leaving the first generator are converted in the second to hydrogen and carbon monoxide. Further, the water gas finally leaves the portion of the fuel bed at the highest temperature, with the result that insufficient time is allowed during the cooling of the gases for the reversal of the chemical reactions and the reproduction of carbon dioxide.

*Carburetted Water Gas.*

As an example of a carburetted water-gas installation, a description is given of the Humphreys and Glasgow plant at present in operation at the Windsor Street Works of the Birmingham Gas Department. This installation, which includes waste-heat boilers, was used for the investigation described in the Seventh Report of the Research Sub-Committee of the Institution of Gas Engineers.

The generator house contains four water-gas sets, each of a guaranteed capacity of 1½ million c.ft. per day, when using 4·3 gallons of oil per 1000 c.ft. of carburetted water gas made, and a generator fuel containing not more than 5 p.ct. of moisture and a total ash and sulphur content of not more than 6 p.ct. on the dry basis. Each of the four sets, which are of the usual Humphreys and Glasgow pattern, consists of a blue water-gas generator followed by a carburettor, a superheater, and a wash-box; but, in addition, two of the sets include waste-heat boilers, which were installed in 1920. One of the sets with waste-heat boiler is shown in horizontal and vertical section in diagram 2.

The generator, which is similar to that of the Humphreys and Glasgow blue water-gas plant already described, is connected by gas off-take pipes, both above and below the fuel bed, with the top of the carburettor. During the blow periods the air enters the bottom of the generator, and the blast products travel through the outlet pipe at the top, and thence, through the carburettor, superheater, and waste-heat boiler, to the stack, which is controlled by a valve at the top. During the run periods, when the blast valve is closed, the steam enters either below or above the fuel bed, and the resultant blue water gas is carried away by the outlet pipe at the top or bottom of the generator, according to whether the steaming is being operated in an upward or downward direction. The blue gas is then enriched with oil in the carburettor, whence it passes through the superheater into the wash-box, and thence to the scrubbers, condensers, and purifiers. Neither the blue gas nor the enriched gas is allowed to pass through the waste-heat boiler.

From the generator, the blow or run gases pass into the top of the carburettor, which consists of a cylindrical steel shell lined with firebrick blocks separated from the metal by annular spaces packed with non-conducting material. The carburettor is filled, according to usual practice, with chequer brickwork reaching to just below the level of the gas intake, and supported on four firebrick pillars each about 9 in. diameter. The enriching oil is fed into the top of the carburettor through an adjustable spray-nozzle, which is protected by a firebrick cone. Separate inlets, side by side at the top of the carburettor, are provided for the gas produced in the generator when steaming in upward and downward directions. An air valve is also provided at the top of the carburettor for the admission of the requisite quantity of air during the blow periods to burn sufficient blow gas to heat-up the carburettor and superheater to the temperature desired for cracking the enriching oil.

The superheater consists of a cylindrical steel shell lined with firebrick blocks and filled with chequer brickwork as in the case of the carburettor. By means of control valves, air may be admitted to the bottom and top of the superheater as required during blow periods, for the purpose of burning further quantities of gas. Much of the carbon monoxide, &c., remaining in the blow gas, after a sufficient quantity has been burned by the admission of air to the carburettor and to the bottom of the superheater, to heat-up the carburettor and superheater to the required temperatures, may be burned by the admission of a further supply of air at the top of the superheater. By this means, potential heat which would otherwise be carried away up the stack by the blow gas, may be converted into sensible heat and rendered serviceable for raising steam in the waste-heat boiler.

The gas produced during the blow periods passes from the top of the superheater through a brick-lined pipe into a brick-lined chamber at the top of the waste-heat boiler. It then travels downwards through steel tubes into a chamber at the bottom of the boiler, whence it enters the stack. The boiler is therefore of the fire-tube type—*i.e.*, the hot gas travels through the tubes, and the water is on the outside. The steel tubes, which are lap-welded, are supported by two end plates. The boiler is set at an angle to aid the circulation of water, the level of which is kept well above the top plate supporting the steel tubes. Any sludge which collects may be blown-off periodically through the two blow-off cocks—the one situated at the bottom of the boiler and the other at the bottom of the lower circulating pipe connecting the boiler with the steam drum. The necessary manholes are provided, and the top is removable for the purpose of cleaning. The boiler is designed to raise steam up to a pressure of 100 lbs. per sq. in., and the fittings include the usual steam and water gauges and safety valve. Waste gas only is allowed to pass through the boiler, which is out of circuit during the run periods, when the carburetted water gas travels to the wash-box by means of a branch from the brick-lined pipe connecting the top of the superheater with the top of the boiler. In the wash-box, the carburetted gas travels through a water seal of about 2 in., which prevents the gas being forced back during the blow periods. A continuous supply of water and an overflow ensure that the seal is kept at a constant amount.

From the wash-box, the gas passes in series through a scrubber filled with chequer brickwork and through two condensers. As the gas passes upwards through the scrubber, it meets a stream of cold water flowing downwards and distributed evenly by means of sprays at the top. The water, tar, and emulsion flow-out through a seal at the bottom of the scrubber. The gas is further cooled in the condensers, which are of the water-tube type—*i.e.*, the water flows through the tubes and the gas is on the outside. A quantity of the water which has been heated by passage through the condensers is ordinarily run into the feed tank for the waste-heat boiler, the remainder being run to waste.

After leaving the condensers, the carburetted water gas is further purified from tar and emulsion by passage through a tower filled with coke, and in parallel streams through two or more of four Pelouze and Audouin tar and naphthalene extractors. The tar and water from the wash-box, scrubber, and condensers flow into one common main, and then in series through three separators. These separators consist of rectangular tanks each containing several dividing plates, so arranged that the water flows alternately under and over the plates, and the heavier tar and emulsion collect at the bottom. The condensate from the coke-tower collects in a well beneath, and overflows into a pipe which leads to the first separator.

According to the usual routine of operation at the time of the tests described in the Seventh Report of the Research Sub-

Committee of the Institution of Gas Engineers, clinkering was carried out every four hours. The generator was charged with coke to a depth of 8 ft. 9 in. every thirty-one minutes; and the usual cycle consisted of two minutes blow followed by four minutes up run. Occasional cycles included two minutes blow, three minutes down run, and one minute up run, except during the one hour preceding clinkering, when steaming was operated in an upward direction only.

The average compositions of the gases produced during the tests carried out on the two sets with waste-heat boilers by the Joint Committee of the University of Leeds and the Institution of Gas Engineers were as follows:

*Compositions of Gases, Volumes per Cent.*

| — | Blue Water Gas. | Carburetted Water Gas. | Blow Gas Leaving Generators. | Waste Gas Leaving Waste-Heat Boilers |
|---|---|---|---|---|
| $CO_2$ | 6·1 | 5·3 | 11·8 | 16·8 |
| $C_mH_n$ | 0·0 | 5 9 | 0·0 | 0·0 |
| $O_2$ | 0·1 | 0·3 | 0·1 | 0·8 |
| CO | 38 4 | 34·7 | 14·1 | 3·4 |
| $H_2$ | 51·6 | 38·3 | 2·7 | 1·1 |
| $CH_4$ | 0·5 | 10·0 | 0·2 | 0·4 |
| $N_2$ | 3·3 | 5·5 | 71·1 | 77·5 |
| | 100·0 | 100·0 | 100·0 | 100·0 |

The average gross calorific value of the carburetted water gas made was 483 B.Th.U. per c.ft. The coke supplied to the generators contained 11·2 p.ct. ash (dry basis), and the amount (dry) required per 1000 c.ft. of carburetted water gas made averaged 35·66 lbs. The volume of blue water gas produced in the generators per 1000 c.ft. of carburetted water gas was approximately 840 c.ft., so that the amount of dry coke supplied to the generators per 1000 c.ft. of blue water gas produced averaged 42·4 lbs. The average amount of enriching oil supplied to the carburettors per 1000 c.ft. of carburetted water gas—*i.e.*, per 840 c.ft. of blue water gas—was 1·837 gallons. The quantity of water actually evaporated in the waste heat boilers per 1000 c.ft. of carburetted water gas made was 63·85 lbs., which amount was sufficient to supply the steam required for the generators, turbo-blower, exhausters, boiler-feed pump, and oil-feed pump, under the particular conditions of the tests. In this connection, it should be pointed out that the times of the cycles were so adjusted that one turbo-blower was sufficient to supply the air required for the two carburetted water-gas sets.

## Heat Balances and Thermal Efficiencies of Gas Production.

### *Blue Water Gas.*

The Sixth Report of the Research Sub-Committee of the Institution of Gas Engineers, to which reference has already been made, gives more or less complete thermal and chemical balances for the process of manufacture of blue water gas as ordinarily practised in a Humphreys and Glasgow plant. The figures given in the thermal balances have been averaged, and the results thus obtained are arranged in the following table, in which the various items represent heat values in therms per 1000 c.ft. of blue water gas made.

Heat balance in therms per 1000 c.ft. blue water gas made.

One therm = 100,000 B.Th.U.

Heat to raise steam = amount from 60° Fahr. (with 70 p.ct. efficiency)

$$i.e., 1116 \times \frac{100}{70} \text{ B.Th.U. per lb.}$$

| | |
|---|---|
| Heat supplied— | |
| (*a*) Coke to generator | 5·387 |
| (*b*) Fuel to raise steam to generator | 0·535 |
| (*c*) ,, ,, ,, ,, turbine | 0·578 |
| (*d*) Sensible heat of air to blower | 0·005 |
| | 6·505 |
| Accounted for as follows: | |
| (1) Water gas, potential heat | 3·010 |
| (2) ,, ,, sensible heat | 0·118 |
| (3) Steam not decomposed (total heat) | 0·134 |
| (4) Blow gas, potential heat | 1·303 |
| (5) ,, ,, sensible heat | 0·306 |
| (6) Heat lost in raising steam to generator | 0·160 |
| (7) ,, ,, ,, ,, turbine | 0·173 |
| (8) Heat of steam used and lost in turbine | 0·400 |
| (9) Ashes, potential heat | 0·318 |
| (10) Clinker, ,, ,, | 0·022 |
| (11) Dust, ,, ,, | 0·060 |
| (12) Ashes, clinker, and dust, sensible heat | 0·024 |
| (13) Losses not separately determined, leakages, radiation, convection, &c. (difference) | 0·477 |
| | 6·505 |
| Efficiency of gas production per cent.: | |
| Fuel for steam for generator and turbine taken into account | 46·3 |
| Fuel for steam for generator and turbine *not* taken into account | 55·8 |

It should be noted that throughout the balance in this table, the calorific values are taken at ordinary temperature (15·5° C.), and that the figures for amounts of sensible heat represent the differences of the heat contents at ordinary temperature and the temperature of the substance under consideration. The thermal efficiencies of gas production have been calculated according to the principles defined in the Clerk-Smithells-Cobb report to the Institution of Gas Engineers in 1919—*i.e.*, the thermal efficiency is given by the heat in the gas multiplied by 100 and divided by the sum of the heat in the gas, and the heat used and lost in manufacture. Following this definition, the figure 46·3 is given by item (1) multiplied by 100 and divided by 6·505; and the figure 55·8 is obtained by multiplying item (1) by 100, and dividing by the sum of items (*a*) and (*b*).

The heat balance indicates where the heat losses occurred in the blue water-gas tests, and consequently where possible economies might be effected. The greatest individual loss is represented by the potential heat of the blow gas, which accounts for approximately 20 p.ct. of the total heat supplied. The average amount of heat lost as sensible heat in the water gas, blow gas, and undecomposed steam, items (2), (3), and (5), was approximately 8 6 p.ct. of the heat supplied. The heat losses represented by items (2), (3), (4), and (5) might be reduced considerably by the installation of a waste-heat boiler. From calculations which have been made (on certain assumptions) of the heat available for use in a waste-heat boiler, it has been concluded that sufficient steam could be raised to supply the generator and turbo blower, in which case the over-all thermal efficiency would be increased from 46·3 to 55·8 p.ct. Alternative methods of diminishing the loss of heat due to the potential heat of the blow gases might be (*a*) to reduce the amount of carbon monoxide carried away up the stack, by changes in the method of operation of the plant, in so far as such changes could be made without prejudice to the efficient production of water gas during the run periods, or (*b*) to utilize the heat of the blow gases for carbonizing coal.

### *Carburetted Water Gas.*

The Seventh Report of the Research Sub-Committee of the Institution of Gas Engineers describes in detail the results obtained from a comprehensive investigation of the process of manufacture of carburetted water gas of a gross calorific value of about 485 B.Th.U. per c.ft., as ordinarily carried out in a Humphreys and Glasgow plant. At the same time, since the installation included waste-heat boilers, data were procured showing the amounts of steam raised and the resulting increase in thermal efficiency of the whole process. From thermal and chemical balances which were constructed, it was shown that the efficiency of production of blue water gas in the generators of the carburetted water-gas plant, without taking into account steam required or raised, was 53 p.ct. Taking into consideration the differences in the methods of operation, this figure of 53 p.ct. is in agreement with the corresponding figure of 55·8 p.ct. given in the Sixth Report.

The thermal efficiency of the whole process of manufacture of carburetted water gas of a calorific value of about 485 B.Th.U. gross, taking into account the steam required for the generators and for driving the blower, exhausters, oil pump, and boiler-feed pump, together with the steam raised in the waste-heat boilers, averaged 68 p.ct. It was calculated from the figures given in the balances that, if the steam required had been raised externally in boilers with 70 p.ct. efficiency, the efficiency of the whole process would have been only 59·5 p.ct., so that the waste-heat boilers improved the over-all efficiency by about 8·5 p ct. The efficiency of production of oil gas during the cracking of the enriching oil was approximately 90 p.ct.; and it is this high efficiency which caused the efficiency of the whole process to be so high as 68 p.ct., although the blue water gas was produced in the generators with a corresponding efficiency of only 53 p.ct. It is clear, therefore, that in stating the efficiency of production of carburetted water gas with a particular enriching oil, it is necessary to state the quality of gas produced, for the over-all efficiency will be dependent on the amount of oil gas admixed with blue water gas.

The thermal balances of the waste-heat boilers showed that the total heat of the steam raised was only about 45 p.ct. of the heat entering the boilers. The amount of steam raised, however, was sufficient to supply the generators and to drive the blower and auxiliary plant.

## The Complete Gasification of Coal.

This paper should not be concluded without some reference to the means which might be adopted for the complete gasification of coal. Of the many possible methods, it is intended only to refer to those of immediate interest to the gas industry.

It was shown by the Research Sub-Committee of the Institution of Gas Engineers during their investigation of the process of steaming in continuous vertical retorts that, by carrying this process to its extreme limit, the complete gasification of coal could be obtained; but their experiments led to the conclusion that this method, with existing plant, could not be considered a commercial proposition (*vide* Fourth Report of the Research Sub-Committee).

The complete gasification of coal can be secured in two stages by first carbonizing coal by ordinary methods, and then utilizing the whole of the available coke for the manufacture of water gas in a separate installation. With the object of obtaining a higher over-all thermal efficiency than results when the process is carried out in two separate stages, various systems have been designed for the complete gasification of coal in one plant. The general principle underlying such systems is that the heat of the gases produced during the blow periods in the production of blue water gas by the intermittent process is utilized for the purpose of car-

bonizing coal in retorts in direct connection with the water-gas generator.

It is not proposed to give a detailed description of any existing complete gasification plant; and at the time of writing the published results of tests have not been sufficiently comprehensive to enable the construction of complete thermal balances. It is possible, however, by combining the figures given in the Fourth Report of the Research Committee of the Institution of Gas Engineers on carbonization in continuous vertical retorts, with the figures given in the Sixth Report on the manufacture of blue water gas, to construct a thermal balance showing what might be attained by the complete gasification of coal in one plant, under favourable conditions. In view of the interest attaching to the process of complete gasification at the present time, calculations of this nature have been made on the following assumptions: (i.) That continuous vertical retorts with the necessary combustion and circulating flues of the same type as in the Glover-West continuous vertical system are superimposed on a blue water-gas generator of the Humphreys and Glasgow pattern; (ii.) that the retorts are heated by the combustion of the gases leaving the water-gas generator during the blow periods; (iii.) that the coal used consists of Lanarkshire washed nuts, and the products of distillation in the retorts are identical in quantity and quality with those obtained in Test No. 1 of the Fourth Report; (iv.) that the same amount of heat passes through the walls of the retorts per ton of coal carbonized as in Test No. 1 of the Fourth Report; and (v.) that the thermal balance of the production of blue water gas in the generator from the resultant coke corresponds with the average figures given in the Sixth Report.

As a result of these calculations, which, in view of the assumptions made, must be considered only as approximations, it has been possible to construct a thermal balance from which the following information is given.

*Complete Gasification. Single Process.*

Coal used, Lanarkshire washed nuts.

| | |
|---|---|
| Heat supplied in therms: | |
| (*a*) One ton coal (dry basis) | 282·0 |
| (*b*) Additional fuel for steam to generator | 18·4 |
| (*c*) ,, ,, ,, ,, ,, turbine | 31·5 |
| (*d*) Sensible heat of air to blower | 0·2 |
| Total heat supplied | 332·1 |
| Yield of gas, 44,700 c.ft. of 358 B.Th.U. | 160·0 |
| Tar, potential heat | 26·1 |

Thermal efficiency of gas production per cent.:

$$\frac{160{\cdot}0}{332{\cdot}1 \textit{ minus } 26{\cdot}1} = \frac{160{\cdot}0}{306{\cdot}0} = 52 \text{ p.ct.}$$

From this data it may be seen that the thermal efficiency of gas production, taking into account the additional fuel required for raising steam for the generator and driving the blower, is 52 p.ct. This efficiency is higher than would be obtained by complete gasification in two distinct stages, with the production of blue water gas in a plant without waste-heat boiler, since in such case the whole of the heat carried away by the blow gases would be wasted. It should be pointed out, however, that the figure of 52 p.ct. is probably on the high side, since in practice difficulty would be experienced in arranging for the satisfactory combustion of the blow gases, owing to the fact that very different amounts of air would be required for complete combustion of the gases produced at the beginning and at the end of the blow period.

It is interesting to compare this figure of 52 p.ct. deduced for the single-stage process with the over-all thermal efficiency of complete gasification by a two-stage process including a blue water-gas plant with attached waste-heat boiler, in which the whole of the steam required for the generator and blower could be raised. Calculations of the results possible in a two-stage process of this nature, again using Lanarkshire washed nuts, have yielded the following figures.

*Complete Gasification. Dual Process, Including Self-steaming Blue Water-Gas Plant.*

Coal used, Lanarkshire washed nuts.

| | |
|---|---|
| Heat supplied, in therms: | |
| (*a*) One ton coal (dry basis) | 282·0 |
| (*b*) Sensible heat of air to blower | 0·2 |
| Total heat supplied | 282·2 |
| Yield of gas: | |
| Straight coal gas | 56·5 |
| Blue water gas | 84·6 |
| Tar, potential heat | 26·1 |

Thermal efficiency of gas production, per cent.:

$$\frac{56{\cdot}5 + 84{\cdot}6}{282{\cdot}2 \textit{ minus } 26{\cdot}1} = \frac{141{\cdot}1}{256{\cdot}1} = 55 \text{ p.ct.}$$

These calculations show, therefore, that, from a thermal standpoint, it is probable that complete gasification by a dual process including a self-steaming blue water-gas plant would be more efficient than complete gasification by a single process in which the heat of the blow gases was utilized only for the carbonization of coal. The further recovery of heat from the waste gases in the single process by the addition of a waste-heat boiler may be possible; but it is not intended to discuss this matter at the present stage of development.

## DISCUSSION.

The CHAIRMAN said the paper was one of supreme interest to all engaged upon gas-works. Several points had a bearing on the practical use of water-gas plants, not the least of which was that dealing with the comparative effect of the fuel depth in the generator. Since temperature played a part so important in the efficiency of the generator—during the blow and the run—there need be no compunction in regard to increasing the capacity of the plant by broadening the generator. The one point that seemed to retard its application at the moment was that it was impossible to produce a gas suitable for town supply by complete gasification methods as existing to-day.

Mr. L. H. THOMAS (Nechells, Birmingham), in moving a vote of thanks to Dr. Parker for his lecture, inquired if he found that the four-hour clinkering was better than the six-hour. Then there was the vexed question of the effluents from carburetted water-gas plants. Dr. Parker had covered a tremendous amount of ground in his descriptions of the various plants, and the reactions that took place.

Mr. C. F. TOOBY (Coventry) seconded the vote. Dr. Parker had, he said, been responsible for important investigations on the subject of water-gas plants, and he could recommend the perusal of the results of his research work. There was no doubt that water-gas plants would remain for a very long time. Their economic effect on the coke market was very great, and this must be taken into account when considering the question of the manufacture of water gas. At Coventry, during the war period, they accumulated large stocks of unscreened breeze and dust, and its removal became absolutely imperative. It was decided to use it up in the water-gas generators, and during the summers of 1919 and 1920 they put through 1700 tons. They thus got rid of something that was restricting their operations, and also made a profit out of it. They found they could work-up a mixture of coke and 33 p.ct. of breeze and dust, and that the reduction in the gas made per day was 30 p.ct., due to the fact that the fuel offered greater resistance to the air during the blow periods. He would like to ask if Dr. Parker could explain why on a down-run less $CO_2$ was produced than during an up-run.

Mr. WRIGHT (Wolverhampton) said it occurred to him that the $CO_2$ was rather high in the gas made during the tests at Windsor Street. Was the steam cut down towards the end of the run? Again, what was the ash content of the coke used, and had Dr. Parker had any experience with regard to cutting down steam?

Mr. KERR suggested that if the calorific value of the gas made by complete gasification was to be used for distribution in the district, then its calorific value could be increased by carburetting.

The CHAIRMAN said, in regard to the period of charging, it appeared to him that forty minutes was rather long. Since the depth of the fuel played a part in the efficiency of the generator, constancy could not be secured if the charging operations were few and far between. It was possible, he imagined, that the disparity in the charging periods accounted for the differences in the fuel consumptions in the cases cited. As to the question of clinkering, raised by Mr. Thomas, it was obvious that this must depend upon local conditions—the ash content in the fuel used, and the fusing point of this ash. If the presence of iron impurities in the raw material accounted for the difference in efficiencies—in coke and poorer forms of carbon—in water-gas production, the huge masses of clinker which accumulated must interfere with the efficiency of the plant. It was a matter for individual judgment in each case. The disparities in coke consumption in the instances given were very striking. Could Dr. Parker explain, from his knowledge of the conditions which obtained in the production of the gas mentioned, what he thought was the cause of that? Mr. Tooby's remarks as to coke dust in breeze seemed to point to the answer: The relative size of the portions of coke and the eventual solidity of the mass in the generator. Total gasification without some enrichment was not of much use as town fuel; and it occurred to him that some proportion, at least, of the success of total gasification of coal would depend upon the supply to the water-gas portion of commercial oxygen instead of air.

The vote of thanks having been heartily accorded,

Dr. PARKER, replying on the discussion, pointed out that experiments were now in progress on low fuel depths. The Chairman had suggested that, if the temperature of the fuel bed were a most important factor in determining whether $CO_2$ was produced during the blow, the capacity of the generator should be increased by making it shorter and broader. The effect of the temperature was the more important one during the blow for the production of $CO_2$, though he did not say that this was necessarily the most important factor with regard to the run period. Time contact during the run was a very necessary condition—more necessary than in the case of the blow. As to the charging of the generator every forty minutes, the usual routine was adopted; and personally he saw no objection to having a period as long as this. Some authorities recommended a fuel depth of about 6 ft. 6 in. They never got more than 6 in. below that.

The CHAIRMAN: My point was the variation of about 25 p.ct.

Dr. PARKER said if tests were carried out, he thought it would be found that, when the fuel depth was above 5 ft. 6 in., there would be no material differences in the results. It should be remembered that all the air was used-up before it reached the top of the fuel bed, and no further reaction could take place. Regarding Mr. Thomas's point as to whether four-hour clinkering was better than one every six hours, he observed that the tests carried out at both works were the methods ordinarily used. One could not compare one works with another, as the conditions varied. A point such as this could be decided only by different clinkering periods, under conditions in other respects the same. The best period would depend upon the amount of ash in the coke, and the nature of this ash, and also whether it had a high or low fusing point. That could be decided only by trials. In regard to the question of effluents, Dr. Parker stated that at the Windsor Street works they had had no serious trouble with emulsion; they were able to recover some tar from it. They had no other difficulty. He believed the only way to deal with the problem thoroughly would be to carry out an investigation by cooling the gas as it left the plant at different rates. If it were cooled rapidly, a percentage of emulsion might be obtained different from that if the cooling were done slowly. He agreed with the points raised by Mr. Tooby as to the value of water-gas plants, in that they enabled one to use-up breeze and dust,

which might become a drug on the market. He imagined, also, that unless the rate of steaming was reduced the carbon dioxide would be increased. A more powerful blast could be used with advantage. In most cases the blower was suitable for ordinary coke; and there was no margin for increasing the rate of the blast. It had been suggested that they obtained more carbon dioxide in the up-run than in the down-run. The reason for this, to his mind, was that they reduced the time contact of the steam with the hot fuel. As to the remark that there was a high $CO_2$ content in the carburetted water gas made in the tests at Windsor Street, it should be remembered that whether it was high or low within limits was not now of great importance. The amount of steam passed through the generator in the Windsor Street tests was decreased as the run proceeded; no operating was done by a lever. The steam required for the generator and the turbo-blower was supplied from the waste-heat boiler. At the end of the blow period the steam was at its maximum pressure, and then gradually decreased during the run. After that it rose again during the blow period. At the present time, in tests that were being carried out, they were aiming at reducing the amount of steam—the rate of flow of the steam. The ash content in the coke used at Windsor Street was 11·2 p.ct. As to Mr. Kerr's suggestion in relation to the increasing of the calorific value by carburetting, it was a possible method. Regarding the use of oxygen in complete gasification, the proposition had a pleasant sound, if they could get cheap oxygen. They would then do away with the large loss of heat that resulted from the carbon monoxide gas going away to waste. He believed experiments had been tried in this direction.

## NEW PROPOSALS OF THE SOUTH STAFFORDSHIRE MOND GAS COMPANY.

### Supply of Mond Gas to Gas Undertakings.

THE South Staffordshire Mond Gas (Power and Heating) Company were incorporated by their Act of 1901. By it they were authorized to manufacture, supply, sell, and distribute within a defined area, the producer gas commonly known as Mond gas, and any development of it approved by the Board of Trade, or any other producer gas so approved, for motive or other power, heating, or any other purpose to which such gases could be applied. But the Act provided that such gases should not be supplied or used for illumination, and that the Company should not distribute gas for use in private dwelling-houses. It also limited the percentage of carbon monoxide which might be contained in such gas.

The Company are promoting a Bill in Parliament. The preamble points out that, by the Gas Regulation Act of 1920, new provision was made for regulating undertakers authorized to supply gas, and for controlling the composition of, and for testing, the gas sold by such undertakers. Now it appears that certain undertakers authorized to supply gas in limits of supply within, or adjacent to, the district of the Company are desirous that the latter should supply gas in bulk to them, which would enable them "to afford supplies of gas to the public more cheaply than they could otherwise supply the same." Therefore it is submitted that it is expedient that the provisions of the Act of 1901 which limit the supply and use of Mond gas and the percentage of carbon monoxide contained therein should be amended, and in part repealed, by the present measure.

Turning to the clauses of the Bill, it is seen that the Company propose that they shall, on its passing, be known by the shorter title of the South Staffordshire Mond Gas Company. Then it is provided that, notwithstanding anything contained in the Act of 1901, the Company and any gas undertakings may enter into, and carry into effect, agreements for the supply by the Company to such undertakings of gas in bulk upon such terms and conditions as may be agreed upon. Following, it is proposed to enact that the gas so purchased shall only be supplied to consumers when mixed with the gas produced by the undertakings, so that the gas shall have the distinctive smell of coal gas; and nothing in this section is to be deemed to relieve any gas undertaking from any liability or obligation under any Act or Order relating to the supply of gas. A further sub-section prohibits the Company from breaking-up any street outside their own district; likewise any gas undertakings are prohibited from laying any mains or pipes, or breaking up, or interfering with, any street beyond their own limits of supply. Nor are the powers of the Act to prejudice or affect any authorization, obligation, or liability with respect to breaking-up streets or executing works conferred or imposed upon the Company by their Act of 1901. There is a clause entitling the Company to recover rents or charges due to them for gas-fittings and materials supplied, or on account of the provision of gas.

Returning to the preamble, it is seen that the Company have issued £340,712 ordinary 10 p.ct. capital, and £82,500 6 p.ct. cumulative preference capital. They have also issued £128,330 5 p.ct. debenture stock; but the amount raised is £107,830. All interest due on the debenture stock has been paid; and, except in 1920 and 1921, dividends have been paid at the rate of 6 p.ct. per annum on the preference capital. But the Company have been unable to pay any dividend on their ordinary capital, except in the years 1911 to 1913, in which they paid 1 p.ct., 2½ p.ct., and 1¼ p.ct. respectively. It is pointed out that the Company's plant suffered considerable damage through the conditions that prevailed for the supply of gas to munition factories during the war; and the Company have since incurred large losses by reason of stoppages in various industries. At the same time, they are heavily indebted to their bankers for temporary advances, expended by them on their undertaking. They are now affording supplies of gas for power and heating purposes to a large number of factories and other premises, and have been asked to extend their system of supply, but are unable under their existing powers to raise the money required for the extensions, or the money needed for the proper carrying-on of their undertaking. Therefore they ask for authority to issue the prior lien debenture stock authorized by their Act of 1917; and this, both as to principal and interest, is to be a first charge upon the undertaking. But the powers of the Company of mortgaging or creating debenture stock are to be reduced to the extent of the nominal value of any prior lien debenture stock issued under the provisions of the present measure. They also seek power to issue redeemable debenture stock.

## Prizes for Suggestions.

The Philadelphia Gas Company, and Affiliated Corporations, offer prizes at intervals for the best suggestions made by employees; and in announcing the names of the prizewinners (and the subjects of their suggestions) for the last contest-period, Mr. A. W. Thompson, the President of the Company, remarks that it is a honour to be numbered among those who have been able to present some idea which has resulted in a saving or other benefit to the company who employ him. Any employee who gives his time to study his company's problems, and makes suggestions, shows that he is interested in its welfare. For this reason, all suggestions received are entered as credits on the service records; and instructions have been given to the various officers, when selecting employees for promotion, to give consideration to these credits. On the present occasion a total of $640 has been awarded in prizes for a number of suggestions which will improve the working conditions in one way or another. For the next period there will be a further $200 for those submitting the seven best suggestions, and an unlimited number of $5 prizes for all additional suggestions which are adopted.

## The Future of High-Pressure Gas Supply.

The development of high-pressure transmission in the long-distance distribution of manufactured gas is discussed by Mr. G. O. Carter (Consulting Engineer to the Linde Air-Products Company) in the pages of the "Gas Age-Record." He gives details of systems of such transmission of both natural and manufactured gas, and gives it as his opinion that the next step in the gas industry should undoubtedly be an increase of pressure to correspond with the high-voltage systems used in transmitting electricity. He points out that pressures of 3000 lbs. per sq. in. are being successfully handled every day in many plants in the United States, and declares it is safe to say that there will be no difficulty whatever in providing pipe-lines and compression adequate for transmitting manufactured gas under a pressure of 1000 lbs. per sq. in. To Mr. Carter the day seems not far distant when no organization will finally decide upon plans for new developments to transmit large quantities of gas without first giving very thoughtful consideration to the savings in capital investment which are rendered possible by the use of high pressures in distribution. This, he goes on to say, is a matter that even now merits much serious thought on the part of managers, and one that is receiving an advanced engineering study in many quarters. It is not improbable that the distribution of manufactured gas through high-pressure pipe-lines will be found cheaper than transportation of coal for equal distances. Where this condition exists, the problem as to whether the gas should be manufactured at a point remote from the consumer or be produced locally, is one very likely to be determined in favour of high-pressure and long-distance distribution.

**New Capital Last Year.**—From a review of new capital issues in 1922, it is learned that 6·8 millions sterling were borrowed last year for gas, light [electric light?], water, &c., compared with 9·5 millions in 1921.

**Gas Rates at Chicago.**—That another fight on gas rates is contemplated by the city of Chicago is indicated by reason of the Council Finance Committee's voting recently to appropriate $25,000 to be used in bringing about a reduction in the present $1 rate, should it be found too high. The appropriation is intended for a survey of the Company's books to determine whether a new fight against the tariff should be instituted before the Illinois Commerce Commission.

**Big Gas Pool in Alberta.**—In giving evidence before a Government Commission at Edmonton, investigating the provincial gas question, Mr. L. G. Huntly, gas expert from Pittsburgh, declared that he knew of no pool more favourable for operation than that in the Viking field. He considered it almost certain that the field of 27 square miles contained 60,000,000,000 c.ft. of gas; and it was his opinion that the field extended over 89 square miles, with 80,000,000,000 c.ft. of gas available.

## LOW-TEMPERATURE CARBONIZATION AND THE THERM.

By WALTER CHANEY.

WITH further reference to Mr. George Evetts' criticism contained in the "JOURNAL" of Nov. 15, and instancing the displacement of oil by means of low-temperature gas for enrichment purposes, gas undertaking "B" consumed large quantities of oil for the manufacture of carburetted water gas; and the writer, in order to justify the saving claimed, will re-arrange the figures in accordance with Mr. Evetts' views on "over-all" charges.

*Gas Undertaking "B," Using Large Quantities of Oil.*

Total oil used, 14,132,779 gallons.
Value of oil, £514,518 (less value of tar).
Cost of oil per therm sold, 0·85d.
Percentage of water gas made, 33 p.ct.
Net manufacture, including oil, 8·31d. per therm.
,, ,, excluding oil, 7·46d. ,, ,,
Total therms sold, 144,317,027.
Gas made per ton of coal carbonized, 12,194 c.ft.
Calorific value of coal gas, 520 B.Th.U.
Therms obtained per ton of coal, 63·5 therms.

Mr. Evetts shows a saving of 0·84d. per therm in the manufacture of blue water gas as compared with coal gas, with coal at 40s. and coke at 35s. per ton; but in the present instance the writer will not take advantage of this reduction, but charge both the water gas and the coal gas at the same price.

Cutting-out the use of oil, obviously the cost of the oil should not be included.

| | | |
|---|---|---|
| 60 p.ct. 520 B.Th.U. gas (coal) . . . . . | = | 312 B.Th.U. |
| 30 p.ct. 300 B.Th.U. blue gas . . . . . | = | 90 ,, |
| 10 p.ct. 750 B.Th.U. low-temperature gas. . . | = | 75 ,, |
| Town gas . . . . . | = | 477 B.Th.U. |

Thermal value, charging low-temperature gas at 6d. per therm:

| | | |
|---|---|---|
| 65·4 p.ct. coal gas<br>18·9 p.ct. blue water gas } at 7·46d. per therm . | = | 6·28d. |
| 15·7 p.ct. low-temperature gas at 6d. ,, . | = | 0·94d. |
| Cost per therm . . . . | = | 7·22d. |

Original cost with oil . = 8·31d. per therm.
With low-temperature gas = 7·22d. ,,
Saving . . = 1·09d. per therm.
Therms sold, 144,317,027 = £655,441.

Charging low-temperature gas at 13d. per therm:

| | | |
|---|---|---|
| 65·4 p.ct. coal gas<br>18·9 p.ct. blue water gas } at 7·46d. per therm . | = | 6·28d. |
| 15·7 p.ct. low-temperature gas at 13·0d. ,, . | = | 2·03d. |
| Cost per therm . . . . | = | 8·31d. |

The 13d. per therm is intended to convey the limiting price before the original figure of 8·31d. per therm with oil was attained. On the other hand, if all three gases of which the mixture is composed are charged at 8·31d. per therm, which includes the oil no longer necessary, what is to become of the £514,518? Is it saved?

## WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

### Visit to Maritime Coke-Ovens, Pontypridd.

Members of the Association visited the Maritime Coke-Ovens at Pontypridd, on Saturday, the 16th ult. The party were met by Mr. W. H. G. Watts, B.Sc., who outlined the process adopted

Mr. Watt stated that the ovens are of the regenerative type, fired by 50 p.ct. of the gas made. In their case the remaining gas is, by arrangement with the Urban District Council, sent to their gas-works for distribution. It is their practice to strip the gas for benzole; and the ordinary gas-works methods are adopted for ammonia recovery and tar distillation. Coke-oven gas does not go through the purifiers at the ovens at Pontypridd. The gas is compressed by two reciprocaters, and delivered through a 4-in. main a distance of 2½ miles to the Treforest Gas-Works, where it is passed through the purifiers in the usual manner and sent to the holders. The calorific power averages 493 B.Th.U. gross, and the delivery is from 10,000 to 30,000 c.ft. per hour. The gas is measured by means of a Thomas electric meter; and it was stated that, after passing a quantity of 5½ millions, the difference between that and the station meter at the works did not exceed 100 c.ft. In undergoing purification, it is interesting to note that the temperature has to be raised; and this is done by means of steam-pipes round the purifiers.

The party then proceeded to inspect the ovens under working conditions, and were informed that the coal selected is first washed clean, as the ash content of the resultant coke has to be very low. Consequently, coals are selected with a low ash index, and also a minimum of moisture, as it is found that this considerably affects the life of the ovens. It is not considered advisable to use coal which, after washing, contains more than 8 to 10 p.ct. of moisture. The ovens take a charge of 9 tons, which remains in the chamber from 27 to 28 hours. After the gas leaves the ovens, it is carried off by means of a long foul main to the condensers, and treated in a way similar to ordinary gas-works practice. An inspection was also made of the benzole plant and sulphate of ammonia house.

Later, by permission of the Urban District Council, a meeting was held in the Council Chamber at Pontypridd, at which Mr. V. DODGSON (Junior Vice-President) acted as Chairman. A letter of apology for absence was read from Mr. John Howell (the Chairman of the Gas Committee), who regretted that a previous engagement prevented his attendance, but wished the Association every success in their work.

Mr. D. MUIR (Engineer and Manager of the gas undertaking) read the following paper.

### EXPERIENCES OF CHANGING-OVER FROM MANUFACTURING PLANT TO COKE-OVEN SUPPLY.

At the beginning of this year, the Gas Department of Pontypridd launched a new scheme for the supply of gas to the town. As repairs to the manufacturing plant were due at the Treforest works, and the Great Western Colliery Company were erecting a battery of coke-ovens in our area, the time was thought opportune to consider the advisability of opening negotiations with the Colliery Company for a supply of coke-oven gas. Negotiations were begun, and as a result a contract for ten years was entered into for the supply of surplus coke-oven gas. Under the contract, the minimum quantity to be taken annually is 100 million c.ft., and the maximum 150 million c.ft.

As you have seen this afternoon, the plant at the Maritime Coke-Ovens is most up-to-date. The gas as delivered into our mains at the coke-ovens is measured by a Thomas meter, and the quality recorded on a Simmance-Abady total heat calorimeter. At the Treforest works end, the gas is measured by our station-meter, and the quality recorded on a Simmance-Abady total heat calorimeter.

The gas is conveyed from the coke-ovens to the gas-works, a distance of two miles, through a 4-in. high-pressure welded steel main. This main was tested at 100 lbs. pressure, and was found to be bottle-tight. Through the adoption of high pressure, a saving of approximately £7000 in the cost of the main was effected. On entering the gas-works, the gas passes through one of two Fulton duplex sensitive high-pressure governors, reducing the pressure to 8 in., and thence through the purifiers, station meter, and on to the holder.

Prior to the gas being passed through the high-pressure main, I arranged to have the main charged with air to a pressure of 60 lbs. The valves were gradually opened at the gas-works end of the main, the compressors being run at top speed at the coke-ovens. This thoroughly cleared the main of any deposits which it contained.

Arrangements were made to have the coke-oven gas turned on to the gas-works on Monday, Jan. 23. However, the coke-oven Manager telephoned me at 9.30 a.m. on Saturday, Jan. 21, to say he could then supply, as his ovens had come ahead, and that the contractor's man who was then in charge of the ovens felt he could maintain the supply of gas. I then agreed to take-over the supply at mid day. I ceased charging my retorts at 10 a.m., but arranged for the furnaces to be kept going in case of emergency. At mid-day the supply of coke-oven gas commenced, the quality being quite satisfactory. During the early part of the evening, I had all the retorts drawn, so that they were ready for charging if necessary.

Early next [Sunday] morning, the quantity of coke-oven gas started to diminish, eventually ceasing altogether. This was due to the contractor's man having been too optimistic, and not having taken due regard to the fact that all his ovens would be due for charging at the same time, with the result that enough gas was not being made for a considerable period to keep-up the pressure on the inlet side of the compressor; and it was necessary to utilize the gas being made to maintain the heats of the coke-ovens.

I therefore had to commence charging up my retorts and making water gas. Within three hours from starting-up, I was making my normal hourly quantity. By 6 a.m. on Monday morning, Jan. 23, normal conditions were asserting themselves at the coke-ovens, and a continuous supply was then given. I again drew my retorts, and kept slow fires going for a week. Since then a continuous supply has been maintained, with slight interruptions which were arranged for. The gas supplied is of good quality, the average over the period being 493 B.Th.U. At first it was necessary to regulate consumers' appliances to the new quality of gas; but now there is no trouble.

To avoid difficulty with the purifiers, due to the low temperature of the gas, I have arranged a steam supply round each purifier; and this has worked quite satisfactorily. The naphthalene content of the gas is not high; the average being 4 grains per 100 c.ft.

The agreement made between the Council and the Colliery Company is a very good one, and the gas department are well safeguarded. Under the agreement, the gas supplied is paid for on the therm basis. This incidentally might help to dispel any fears that the "Doubting Thomas's" and Editors of certain papers have that the therm is an elusive fellow, used to extract money without giving value. The therm was decided upon as the basis of payment for our coke-oven gas, to ensure that the gas department had value for money spent. Doubtless this has had

a certain effect on the Colliery Company, resulting in a very constant quality being supplied.

With the introduction of coke-oven gas, the managerial duties have not diminished, but rather increased, on a works this size. It is now necessary to have constant checks made of the gas supplied, in order to guard the gas department under the agreement. It also means that plant must be kept in condition, in case of emergency. The present success of our coke-oven gas supply is largely due to the good relationship existing between Mr. Watts (the Maritime Coke-Oven Manager) and myself, as the personal factor plays an important part in the harmonious working of such a supply. If the respective chiefs of the coke-ovens and the gas department do not co-operate, there is sure to be friction.

In conclusion, I may say that, though coke-oven gas has so far proved beneficial to Pontypridd, any gas authority contemplating a similar supply would have to consider it from their own particular point of view, taking into consideration the condition of their plant and the price to be charged for the supply. I believe that large gas undertakings may yet have their own coke-ovens for manufacturing gas, where local circumstances are favourable.

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A short discussion took place, after which,

The SECRETARY (Mr. B. J. Bell, of Cardiff) proposed that the heartiest thanks be accorded Mr. Muir for his paper and Mr. Watts for the interest he had taken in showing the members over the coke-oven plant. It had been an unique opportunity to see a plant where the making of gas was a secondary consideration, and most interesting to discover that the huge ovens were fired with coal gas. Though the object of the ovens was to produce coke which would be used for metallurgical purposes, it was gratifying to see that, in doing so, gas could be made at a very low figure. It was also interesting to note that very little variation took place in the calorific value, as was shown on the recording calorimeter. As it was possible to deliver gas under 10 lbs. pressure 2½ miles, it was surely within reason to suppose that the same conditions would apply if delivered long distances. As a matter of some little importance, it might be asked what type of jointing was used, and whether there had been any noticeable leakage on the line. It was not every gas manager who could have his finished product delivered to him; but, as Mr. Muir had stated, the effect was not that work was reduced, but rather that responsibility was added.

Mr. J. WOOD, in seconding, said he had gained a considerable amount of information through the visit. The conditions of gas manufacture which they had been privileged to see exceeded expectations; and he was gratified to think that a waste product was utilized to such an extent. He thought there was considerable opening for the type of work they had seen.

Mr. T. NOALL (Cardiff) supported the resolution, which was carried unanimously.

Mr. MUIR thanked the members for the vote. He stated that the joints of the main used were acetylene-welded, and that they had not experienced any trouble through escapes. In order to obviate any likelihood of this happening, he arranged that whenever he had to shut-down for a short while, a test for soundness should be made. In his opinion, there was a great future for the gas industry in districts where coke-ovens were in use, as they could turn a waste product into a saleable and remunerative commodity.

Mr. WATTS said it had been a pleasure for him to meet the members, as the coke-oven industry and the gas industry were very closely allied. He hoped the visitors had thoroughly appreciated the fact that carbonization of coal was a matter, not only for the gas engineer, but for the coke industry; and he felt that the time was at hand when all the coal carbonized would be treated in coke-ovens, as there was a more ready sale for the coke, which was of high quality. He wished to draw their particular attention to the very low sulphur content of the coal used, as the resultant coke had to be nearly free from this. On another occasion, he might be permitted to give more detailed information on the carbonization of coal.

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## Steel and Iron Cutting by Gas.

The Industrial Department of the Public Service Company of Northern Illinois are pushing the use of manufactured gas for cutting steel and cast iron; and the engineers of the department state that whatever can be accomplished with acetylene or hydrogen in this way, can also be done by the means named. In the course of a series of recent experiments in connection with a large plant, material of various sizes and shapes was cut; and a stock of thin plates and a 2½-in. bar were handled with equal ease. The operator placed the tip at right angles to the top face of the 2½-in. square bar, and in a short time had bored a hole clean through it, without any tendency to back-firing developing. Grey iron was cut in the same fashion as is done with acetylene or hydrogen. The experiment, says the "American Gas Journal," shows that the operation can be carried out rapidly, and that the percentage of safety was decidedly increased. The apparatus for performing this work with manufactured gas is similar to that necessary when oxy-acetylene or hydrogen-oxygen gases are employed. The oxygen arrangement does not require changing, and the tip sizes, gauges, and working pressures may be identical. In order to pre-heat the metal before cutting begins, an intense flame of a reducing tendency is necessary; and manufactured gas differs from hydrogen and acetylene in that a larger volume of it is needed to carry through this pre-heating. This accession necessitates changes in the number of tip openings. With respect to costs and saving in time, manufactured gas makes an excellent showing; and as a result of the experiments referred to, engineers of the department predict the adoption of gas for these purposes for several plants.

## COAL TESTING.

By WILLIAM BELL, of Reading.

**[A Paper read on Dec. 15 before the London and Southern District Junior Gas Association.]**

With the limited time at my disposal, it is only possible to deal with the general aspects of this important subject. I therefore do not propose to enter into the details of the various well-known tests, but to confine myself to outlining a system of coal testing suitable for gas-works purposes, and to consider briefly the problems presented. With this end in view, I have divided my remarks into two main sections, which I have termed (*a*) Laboratory Tests, (*b*) Carbonizing Tests. Under laboratory tests may be included the general chemical and physical examination of coal; while carbonizing tests cover the determination of the behaviour of the coal during gas making, and the yields of gas, coke, and bye-products. Carbonizing tests may be carried out either on a large scale in the whole or a portion of the gas-making plant, or in a small test retort.

### SAMPLING.

The importance of obtaining a correct sample of coal cannot be over-emphasized, as any amount of accuracy in the laboratory will not make up for faulty sampling. The difficulties of sampling are due to:

1.—Coal not being a homogeneous substance.
2.—The necessity for obtaining the correct proportions of small and large coal and of any foreign matter, such as shale, slate, &c., which may be present.
3.—The large quantity of coal dealt with on a gas-works.

The proportion of the sample to the total bulk depends to a great extent on the facilities for dealing with the sample; and it is difficult to lay down definite rules except that the proportion should be as large as possible. This proportion is also governed to a certain extent by the physical condition of the coal. Generally speaking, coal is received in one of three conditions—namely, (1) screened; (2) unscreened; (3) nuts, peas, slack, &c. Of these, the unscreened coal is the most difficult to sample, and the proportion of the initial sample to the bulk should be greater than in the case of screened coal or nuts.

The method of sampling will vary according to whether it is desired to deal with a separate consignment, which may consist of a single truck, barge, &c., or the whole of the coal supply to a retort-house. In the latter case, the coal-handling plant will in all probability provide the best means of obtaining a sample—by taking a suitable portion from the conveyor track. From this comparatively large quantity of coal it is necessary to obtain a representative sample of the original coal, which shall be of a suitable weight and degree of fineness for laboratory purposes. This is usually done by breaking it by hand on a clean iron plate, and reducing the sample to the required bulk by successive "coneings and quarterings." This operation may be more conveniently carried out in one of the sampling mills at present on the market, which grind the coal and withdraw a definite percentage, which in some cases may be varied at will. The final sample as received in the laboratory should pass a 20-mesh sieve. Two samples should be taken—one for analysis and one to be kept for reference purposes. Before making any estimation other than of moisture, it will be necessary to grind the sample still further.

### MOISTURE.

Having thus obtained the sample, the first determination necessary is that of the moisture content. With coals having a high percentage of moisture, considerable loss takes place during the sampling operation; and it is often advisable to take a sample for this determination at an early stage. The usual method of moisture determination—by drying a weighed quantity in an oven at temperatures ranging from 100° to 110° C.—may give rise to errors, due to the fact that many coals are readily oxidized at this temperature. This may be avoided by drying in an atmosphere of inert gas, and ascertaining the moisture by the difference in weight of the coal, or by weighing the water direct after absorption in calcium chloride tubes. This removes the difficulty in the final weighing due to the hygroscopic properties of the coal.

### VOLATILE MATTER.

In a paper of this length, to deal with ultimate analysis would be impossible; and although proximate analysis does not give much information as to the gas-making qualities of the coal, it is very useful for the purpose of comparison, and as a means of checking the constancy of deliveries. In proximate analysis, care should be taken that the mode of procedure is always exactly the same, as comparability of results depends entirely upon this. This applies especially to the determination of volatiles, wherein the following points should receive attention:

(1) The portion of the crucible containing the coal should all be enveloped by the flame; the crucible being supported by a thin platinum wire.
(2) The distance between the top of the burner and the bottom of the crucible should always be the same.
(3) The flame, which should be of a definite height, should be protected from draughts.

### ASH.

When ash estimations are made in an open crucible, loss may take place through the projection of small particles out of the

crucible. This may be avoided by carrying out the determination in either a muffle or tube furnace in a current of air or oxygen.

### SULPHUR.

Sulphur in coal is usually ascertained by one of the following three methods:

1.—By the use of a deflagrating mixture.
2.—By slow combustion of the coal in intimate contact with a mixture such as "Eschka's," which consists of three parts of sodium carbonate to one of magnesium oxide; a soluble sulphate being formed which is precipitated as barium sulphate and weighed as such. A blank test should be made, using the same quantity of reagents as in the actual test, which should always be the same.
3.—From the residue left in the combustion chamber after the determination of the calorific value of the coal.

### SULPHUR (FIXED).

If it is desired to determine the free and fixed sulphur as distinct from the total sulphur, an estimation of the sulphur in the coke must be made. From this the fixed sulphur in the coal can be calculated; the free being obtained by difference. The information thus obtained is valuable from the point of view of the purification of the gas.

### CALORIFIC VALUE.

For the determination of the calorific value, one of the simpler types of calorimeter, such as Roland Wild, Thompson, or Rosenhain, is preferable for gas-works purposes. In the first type, the coal is mixed with sodium peroxide, and combustion takes place in a nickel bomb. In the other two types, the coal is burnt in an atmosphere of oxygen; the products of combustion being allowed to escape through water in the calorimeter vessel. In each case, the water equivalent of the apparatus must be carefully determined by the combustion of a substance of definite composition and known calorific value.

Before leaving laboratory tests, it might be of interest briefly to describe a method of obtaining a "coking value" of a coal. In this, a known weight of coal is mixed with increasing proportions of a non-coking material, such as finely ground retort carbon or sand. The mixture is treated as in the estimation of volatile matter, and the coke so obtained is subjected to an impact test —*i.e.*, a definite weight is dropped on it from a fixed height. The proportion of carbon or sand in a coke which breaks down under this test is taken as the coking value; or the proportion of inert material may be increased until the mixture refuses to coke.

### CARBONIZING TESTS.

These are frequently carried out in a small test retort, often made of cast iron, maintained at a comparatively low temperature. Since results thus obtained may differ materially from those obtained on the works, the results from a coal (the behaviour of which on the works is known) should be taken as a basis of comparison. From a gas-making point of view, the most satisfactory tests are those performed on a works scale; but as this is often impossible, quite satisfactory results may be obtained by the isolation of one or more retorts, the gas from which is separately purified, metered, and collected in a small holder for testing. The coal carbonized and the coke produced are carefully weighed, and the liquid bye-products also collected, weighed, or measured, and their value determined. By this means the value of any of the different coals in use may also be accurately determined.

In conclusion, it may be interesting to describe a large-scale test. In this connection, it must be pointed out that close attention to detail is essential. It is first necessary to decide the conditions under which the coal is to be carbonized, and the duration of the test. This will, of course, depend upon the amount of coal available. Before starting the test proper, it is necessary to carbonize a portion of the coal to be used, so that conditions may be the same at the start and finish of the test. The coal bunkers are therefore emptied, and sufficient coal for this purpose elevated. When the coal bunkers are again empty, the test is started. At this point all meters are read, the contents of wells and tanks ascertained (samples being taken), and the producers filled up with coke. Weights must now be taken of the coal elevated, coke made, coke fed to producers, and clinker withdrawn; suitable samples being taken of each. During the test period, conditions must be kept constant; and it is advisable to take meter readings at frequent intervals. Calorific value and analyses of the gas made should be taken regularly; also the analysis of the producer gas, and the waste gas from the settings. The temperature of the setting should be taken with a pyrometer. At the conclusion of the test, the coal-bunkers must again be emptied, producers filled up, meters read, and the contents of all tanks obtained as before; care being taken that the volume of liquid in circulation through washers, scrubbers, &c., is the same as at the start of the test. The volume of water added must, of course, be ascertained, and samples of tar and liquor taken as before. From the data thus obtained, a weight balance may be calculated which serves as a valuable check on the accuracy of the test.

## DISCUSSION.

The PRESIDENT (Mr. D. Cleave Cross, Lea Bridge) said the paper was a very interesting summary of coal testing, and one could see from it that Mr. Bell thoroughly knew his subject. Personally, so far as coal testing was concerned, he preferred the carbonizing test. This was the one which was most important. Some of the bigger companies could arrange for accurate sampling. The arrangement brought to their notice last session by Mr. J. S. Thorman for this purpose was a very fine one. But with smaller companies, who perhaps took tests of spot samples, the results did not quite tally with the carbonizing results. Some of the latter, he was afraid, did not spend the time on coal testing that they should do, because next to labour coal was their greatest expenditure. The amount of inerts sent along with coal was simply enormous; and there was not sufficient outcry against it. A truck that came through to his works a few days previously had 3 in. of clay at the bottom, which was, of course, charged to the Company at the current rate for coal. Touching upon laboratory tests, he believed Dr. Colman had remarked that some of the younger chemists especially did not quite realize the loss of moisture that occurred in grinding a sample. This must be watched very carefully.

Mr. T. V. JOHNS (Richmond) asked if the author could give him the name of any particular coals that would oxidize at 110° C. With regard to ash estimation, often gas managers said that a coal containing 6 p.ct. of ash was much inferior to another containing 2 p.ct., whereas the 6 p.ct. ash might be more profitable in the long run, taking into account fusing qualities.

Mr. F. A. FROST (South Metropolitan Gas Company) said there was no doubt that the employment of laboratory methods for testing coal was of the greatest advantage to those who had large consignments of coal to deal with in their works. He believed it was the practice of the South Metropolitan Gas Company to have taken a fairly representative sample of each cargo of coal as loaded, and chemists on the spot made an estimation for moisture, ash, and volatile matter, which was passed on ahead of the coal, so enabling those who would have to deal with it when it arrived to know what to prepare for. In the estimation of moisture, there were many pitfalls. He thought it was an accepted fact that oxidation did take place as stated, though he could not call to mind any particular coal in this connection. The small experimental plants usually found on gas-works gave no criterion of the results that could be obtained in large-scale practice; and if the results were to be worthy of taking any notice of, it was essential to isolate, not only one retort, but preferably a whole bed. Of course, it was only necessary to test coal in this way periodically. In many works the same coal was used year in and year out; but when a new coal was under consideration, it was a great advantage to have a setting for testing it on a working scale.

Mr. W. GROGONO (Gas Light and Coke Company) said the testing of coal should be standardized for all gas companies. When they were comparing results obtained by different companies in different plants, unless they knew something of the coal that was being used, he thought the results were not worth having. It was, for instance, no use taking lumpy coal and using it in verticals, and taking dust and using it in horizontals, and then comparing the two results. He thought any chemist would tell them that lumpy coal and dusty coal had an entirely different composition, and that, in the case to which he had just referred, really different coal was being carbonized in the two plants, and then the working results of the plants were being compared. Unless there was some standard method adopted of testing coal, so that they knew exactly what was being used in each case, it was impossible to compare properly the results from different plants. He would therefore like to see some standard method brought forward for adoption by all companies.

Mr. W. NEWTON BOOTH (Woolwich Arsenal) pointed out that this subject was now being dealt with by a Committee of the Fuel Research Board.

Mr. A. W. MAYO (North Middlesex Gas Company) remarked that, in testing for volatile matter, the sample of coal was placed in a crucible. The method he himself adopted was to place the sample in a silica tube shaped like a test tube.

Mr. P. L. W. WOOLLEY (Croydon) said it was a good plan to take one truck of coal out of a number, and go carefully right through it, so as to see exactly what was there. Some wonderful things were revealed.

Mr. F. J. PEARCE (North Middlesex Gas Company) supported what Mr. Grogono had said about the great importance of standardizing these tests. He was glad to hear that the matter was being dealt with by the Fuel Research Board. He was afraid that on many works coal testing was not given as much attention as it might be. Possibly this was due sometimes to lack of apparatus, because, after all, he did not place a great deal of faith in tests carried out in a very small plant, using (say) 1-100oth of a ton. At the works where he was engaged before he came to London, the testing plant consisted of a cast-iron retort holding about 2 cwt. of coal, heated by a direct-fired furnace; and with the exception that there was no exhauster, a complete set of apparatus was provided for the gas, which was passed into a holder weighted to give a slight vacuum on the retort. With this plant he obtained exceedingly valuable results for judging the qualities of the various coals. As far as he could see, that size of plant was really the smallest size with which one could obtain results worthy of the trouble they entailed. A remark had been made about the wonderful things that some companies found in coal. He could fully bear this out; and he would like to enter a protest against the bad quality of coal that had been coming along during the last few weeks. It had been so bad in some cases that he had had the stones, &c., picked out and sent back to the colliery, so that they could see for themselves what was being done.

Mr. E. W. L. NICOL (London Coke Committee) said this was an important matter, as affecting the revenue from coke very materially. His own view was that the time to test the coal was not at the works, and not at the coal-tips where the ship was being loaded, but at the pit-head, before the contract was made. In other professions, one did not look a horse in the mouth after one had bought it. Then it was too late. The adverse effect of excess solid inerts in coal was not only on the quantity and quality of gas produced, and other minor products, but on the coke itself. The ash content of the coke determined not only its calorific power, but to a very large extent its moisture content. Coke made from unsuitable coal with a high ash content had a remarkable affinity for water—much more so than a good quality hard coke. So that coke made from bad coal absorbed and retained moisture; and now that so much business was being done with steam users, the ques-

tion of selling coke to the best advantage was one that had to be considered. They were actually up-against this at the present time. Of the coal carbonized, probably one-half had to be sold as coke, and this contained perhaps double the number of therms that were in the gas produced from the same coal. Therefore the question of selling coke on its thermal basis was an extremely important one, and was one that went right back to the purchase of the coal.

Mr. BELL, in reply, said he agreed that the carbonizing test was the most important; but, of course, it was not always possible at a moment's notice, when someone in authority might want to know exactly how the coal stood. Laboratory tests, if carried out under the same conditions, would give near enough results at least to compare with other coals. Mr. Johns asked about oxidation at 110° C. He thought it would be found that this did happen; but, of course, Mr. Frost had already answered this question for him. Offhand he could not name any particular coals; but he believed it was the case with most gas-works coals, at any rate. He agreed with Mr. Johns about the fusing properties of ash. This was an all-important point. One might have a small percentage of ash which would give more trouble than a larger amount. As Mr. Grogono said, it was time they had standard methods of analysis for coal. At present they were all working on different lines, and so the results were not comparable. Mr. Pearce had referred to a small test plant. He (the speaker) had a similar one, and it was really wonderful how close the results were that one could get making two or more tests on the same coal. Some remarks had been made by Mr. Nicol about moisture in coke. Apart from certain coals giving a coke which would contain moisture, it seemed to him that the carbonizing process had also something to do with this. Vertical retort coke would not hold moisture so much as coke from horizontal retorts.

## FUSIBILITY OF ASH FROM COALS OF THE UNITED STATES.

By W. A. SELVIG and A. C. FIELDNER.

[A note contributed by the Director of the United States Bureau of Mines to the "Journal of the Franklin Institute."]

The Bureau of Mines have made a general survey of the "fusing" or "softening" temperatures of the ash from coals in the United States. Data on the fusibility of coal ash should be of considerable value to the coal consumer, mainly in connection with the troublesome formation of clinker resulting from the melting of the ash constituents in burning coal. When used together with the large number of coal analyses published by the Bureau, they will assist the consumer in comparing different coals, and in selecting the coal best adapted to his purpose.

The ash is the incombustible residue after complete combustion, and is derived from the inorganic mineral constituents. These are (1) inherent impurities in intimate mixture with the coal substance, (2) impurities such as clay, shale, pyrites, and calcite present as partings, layers, or nodules in the coal-bed, and (3) fragments of roof or floor mixed with the coal in mining.

Coal ash varies so widely in chemical composition that no typical composition can be given; but it generally falls within the following limits: Silica, 40 to 60 p.ct.; alumina, 20 to 35 p.ct.; iron oxides, 5 to 25 p.ct.; lime, 1 to 15 p.ct.; magnesia, 0·5 to 4 p.ct.; and alkalis, 1 to 4 p.ct. The fusibility depends on several factors, such as ratio of bases to silica present, the particular bases, and the percentage of alumina. For example, ash extremely high in silica or in bases is not readily fusible. Ash low in iron is usually so high in silica that it is not readily fusible. Ash of coals high in pyrites contains much iron, and is likely to form clinker; the iron converting to ferrous oxide, which unites with silica to form easily-fusible silicates.

Some coal ash is so infusible that little clinker is formed; and ash slightly fusible often forms a porous, spongy clinker which does not obstruct the flow of air through the fuel-bed, and is easily removed. Ash with a low fusing temperature—say, 2100° Fahr.—may become quite fluid, and spread out in a thin sheet, obstructing the flow of air and localizing the heat in the fuel-bed.

In general, the softening temperature of ash from coals in the United States ranges from 1900° to 3100° Fahr. Ashes may be classed as: (1) Refractory ashes, softening about 2600° Fahr.; (2) ashes of medium fusibility, softening between 2200° and 2600° Fahr.; and (3) easily fusible ashes, softening below 2200° Fahr.

**Scotch and Kentucky Oil Shales Compared.**—The United States Bureau of Mines have recently completed some tests on Scotch and Kentucky oil shale samples. They report that the Kentucky shale yields a relatively small amount of oil, and the oil is of very asphaltic nature; the specific gravity varying, according to the rate of retorting, from 0·926 to 0·947. The influence of rate on the quantity and quality of motor fuel fraction is shown remarkably well by the results of this work. The most rapid run yields an oil producing 21 p.ct. motor fuel fraction, with an unsaturation of 39·7 p.ct., and the slowest run yields an oil producing 25·8 p.ct. motor fuel fraction with an unsaturation of 32·4 p.ct. The gas produced from the Kentucky shale runs high in hydrogen sulphide and low in carbon dioxide. The Scotch shale yields the best oil thus far produced in the laboratory. It is decidedly of a paraffin nature; and though complete tests on the oils are not available, the percentage of unsaturation in the motor fuel fractions is quite low. The gas produced from this shale contains as much as 35 p.ct. of carbon dioxide; and this, of course, cuts down its fuel value.

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

### The Therm Inquiry.

SIR,—Referring to the inquiry now being held into the therm system of gas supply, while agreeing that the method of charging for heat units supplied is a correct one, in my opinion the dominating factor in the whole question is that of the *quality of the gas supplied*, and not the relative price at which the therm is sold. The price will vary throughout the country, according to local circumstances and geographical position, and generally as to the proximity of suitable coalfields.

A consumer moving from one part of the country to another is fully aware that prices of commodities, including gas, vary; but unless it is brought home to him in a very direct way, he is unable to tell whether the gas he will be supplied with is similar to what he has been accustomed. Therefore the consideration as to whether his gas appliances will, or will not, give the same duty, or will require adjustment, depends entirely upon the quality of the gas available.

Again as to measurement of gas for purposes of accounting, gas must of necessity always be measured by volume first; and the gas-meter will do this uniformly, irrespective of quality. But to meter therms requires an adjustment which will vary as the quality of gas varies. While a gas-meter inspector can certify as to the meter correctness or otherwise for volume, it requires another official in the gas examiner to testify as to the correctness or otherwise of the quality of that volume measured; and where meters are sent out of a town which supplies a gas of (say) 450 B.Th.U. quality to be tested in the town of the nearest testing-station, and where the gas available for testing is 500 B.Th.U. quality, the gas-meter inspector can only test for volume.

If gas undertakings were given the option of charging by therm or by *cubic feet of a stated quality*, I am of opinion that many would ultimately adopt the latter.

*Gas-Works, Teignmouth, Dec.* 26, 1922. H. HIGHAM.

["Charging by cubic feet of a stated quality" would simply mean going back to the condition of things that existed before the passing of the Gas Regulation Act. If this were done, a new policy would be adopted by the authorities, including the abandonment of that important economic concession to the gas industry—the "declaration" by the undertaking itself of the most suitable calorific power that can be supplied at any given time, according to plant conditions and available coal supplies. This concession holds in it liberty for technical progress; and the industry must not deliberately resign it. That liberty to "declare" a value is bound-up with the therm basis of charging.—ED. "G.J."]

### Comprehensive Gas Accounts.

SIR,—I note your reference to the Bristol gas account in your issue of Dec. 27. It may be of interest to you to know that my Company was one of the first undertakings, in March, 1921, to obtain an Order under the Gas Regulation Act, and that the account you refer to is similar to the one issued by my Company to its consumers for the quarter ended June, 1921, copy of which was forwarded to the Bristol Gas Company on April 22 of last year—two days after they had obtained their Order. In addition to the account, a pamphlet is issued explaining in full the therm. My Company realized that it was most essential that full explanation of the therm should be given to the consumers, in order that no misunderstanding should arise in their minds, and that their full confidence should be retained.

Further, I have had placed before me a copy of the account issued by a gas company showing only therms used, and no other statement, with the result that it is impossible for the consumer to check his account with the reading of the meter. Such accounts certainly do not assist in obtaining the confidence of the users of gas; and feeling that it was a very important matter, I brought it before the October meeting of the National Gas Council.

I enclose, for your inspection, copy of the account form and pamphlet referred to.

*Sheffield Gas Company, Jan.* 2, 1923. RALPH HALKETT, General Manager.

# REGISTER OF PATENTS.

### Distillation of Solid Carboniferous Matter.
### No. 188,019.

MARKHAM, C. P., of Chesterfield, and THE STAVELEY COAL AND IRON COMPANY, LTD., of Staveley.

No. 17,587; June 28, 1921.

This invention relates to the production of oils and other volatile products, with or without a smokeless solid-fuel residue, by the distillation of solid fuels—e.g., coal, carbonaceous material, carboniferous shales, and the waste material picked out in coal mines (which is usually considered unfit for fuel), peat, lignite, and other carboniferous matter. The invention is directed to obtaining good yields of oils and other hydrocarbons, and of organic acids and ammonia or ammoniacal products.

In the shale-distilling art, one of the early methods proposed was that of downward distillation by combustion started at the open top of a vertical column of shale, and burned to the bottom thereof; the pro-

ducts of distillation being drawn off at the bottom by suction. It was soon found, however, that yields of oil were greatly improved by distillation of the shale in externally heated retorts working continuously; and these are now universally used in shale-distilling works. In the modern retorts, a definite temperature gradient is maintained from top to bottom, and the hottest zone is at the bottom. The distillation is conducted in the upper part by external heat and by the gases produced by burning the downwardly moving coke with air and steam in the lower part of the retort. Fixed combustible gases (say, from 3000 to 10,000 c.ft. per ton) are thus produced, which pass through the upper part of the retort, and, after separation of the oils, &c., are led away to burners and used for heating the retorts. Superheated steam has also in many cases been passed through the retorts to react with the coke, and to facilitate distillation at low temperatures.

Again, coal and other carbonaceous fuels are distilled both at high and low temperatures in vertical retorts primarily for the production of illuminating or heating gases, and secondarily for the recovery of oils, ammonia, and tars, and for the production of coke or semi-coke. For low-temperature distillation these retorts are in practice externally heated; but proposals have been made to work with partial combustion with air of gases made in separate producers, adding steam or superheated steam thereto.

In all the above cases, fixed combustible gases are obtained as a primary product. Further, in gas producers for the manufacture of power or heating gas, it has been proposed to distil downwardly the bituminous fuel by drawing or forcing steam and air through the fuel column. In such producers, however, high temperatures are always attained throughout the mass of the fuel column; and, as before, fixed combustible gases form one of the primary products, if not the main product.

The patentees claim to have found that it is possible to effect distillation of bituminous fuels and shales by combustion which is very slight as regards the solid carbon, but practically complete as regards the fixed gases produced, and thus to get the types of solid and liquid products of very low temperature distillation, while obtaining better yields of oils of the paraffin and olefine series than are produced by distillation in modern shale retorts.

The objects of the present invention include: (1) Avoidance of the production of fixed combustible gases; (2) the production of high yields of oils and hydrocarbons of the paraffin and olefine series; (3) the production of high yields of ammonia; (4) the production of residual coke or semi-coke where the fuel contains sufficient fixed carbon to make the residue suitable as a fuel.

## Photometers.—No. 188,421.

CLARKE, C. H., of Snaresbrook.

No. 22,522; Aug. 24, 1921.

This invention relates to photometers in which a standard source of light is produced by the action of a radio-active substance on a fluorescent material. The invention is also applicable to pyrometers which work on the photometric principle. The light emitted in such circumstances has usually a green colouration, and necessitates the use of a tinted screen over the light to be measured, so as to enable a satisfactory match to be obtained; and the object of the present invention is to enable a match to be obtained with a high degree of accuracy without screening the light with any device which would discriminate between the wave-lengths cut off.

Owing to the small amount of light emitted, it is usual in such instruments to view the standard source directly instead of using it to illuminate a surface; the standard light covering a portion of the field of view the remainder of which is illuminated by the light to be measured. According to this invention, the standard light is made to cover the whole of the field of view alternately with the light to be measured any desired number of times during the process of measurement, so that the standard light and the light to be measured are viewed alternately in a flicker photometer.

The preferred manner of carrying this method into effect, when the radio-active substance and the fluorescent material are kept separate within the instrument and brought into juxtaposition as and when required, is illustrated by eleven drawings, and described in about three pages of text, with no less than twenty-six claims attached.

## Manufacture and Combustion of Gas.—No. 189,475.

HELPS, G., of Nuneaton.

No. 14,605; May 26, 1921.

No. 14,725; May 27, 1921.

The patentee points out that in the distribution of a low-grade gas, particularly producer gas, certain disadvantages have been met with due (1) to the necessity of having to distribute greater volumes for a definite heat content, (2) to the fact that when such low-grade gas is mixed with air in the proportion necessary for complete combustion the resulting flame temperature is lower owing mainly to the original nitrogen content in the gas, and (3) to the instability of the flame owing to debility and lack of homogeneousness. The object of the invention is to allow the distribution of gas having a relatively high original nitrogen content which will give an improved flame temperature when such gas is burnt with additional air.

This object may be achieved by mixing the low-grade gas (by which is meant a gas of under 350 B.Th.U. gross) with such a volume of oxygen that when the mixed gas is burnt to complete combustion with air, the total volume of nitrogen present in the ultimate mixture approximates to, or is less than, the total volume of nitrogen usually found in mixtures of high-grade gas and air such as to ensure complete combustion.

Alternatively, to the same end, oxygen is added to the air used in an ordinary producer or the like so as to reduce the nitrogen content.

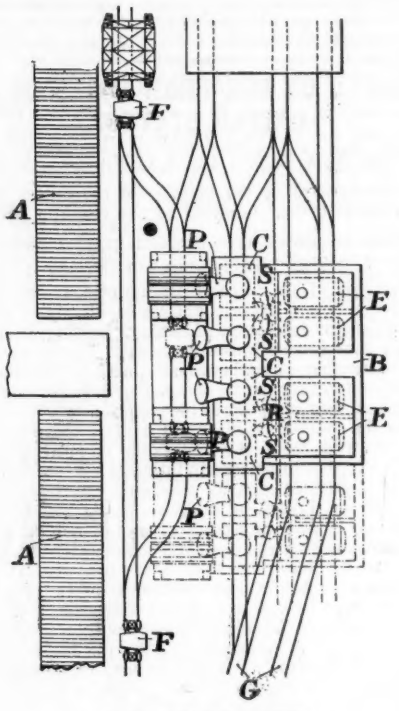
The patentee is aware that it is not new *per se* to obtain a gas which contains oxygen either by mixing oxygen with made coal or like gases or admixing it during the process of manufacture. He is not claiming this broadly, but only with a low-grade gas as described and in the proportions specified.

## Coke-Cooling Plant.—No. 188,593.

SULZER FRÈRES SOCIÉTÉ ANONYME, of Winterthur (Switz.).

No. 2720; Jan. 30, 1922. Convention date, Nov. 8, 1921.

This invention relates to plants for cooling incandescent coke and utilizing the heat derived therefrom. In the construction illustrated, a range of coke-ovens or retorts A are placed conveniently close to a cooling apparatus B to which the hot coke is conveyed from the retorts by means of trucks or the like F. The cooling apparatus comprises heat-exchanging devices each of which consists of a cooling chamber C and a heat accumulator, which represents (say) a steam generator E. The cooling chamber and generator are so connected that the heat given up by the coke is transferred to the generator by means of a neutral gas forced to flow in a cycle through the incandescent coke and generator. On leaving the retorts the incandescent coke is conveyed by trucks F to charging hoppers P, whence the coke passes to the cooling chambers; the latter being arranged above a track G and so placed that the cooled coke leaving them is directly discharged into further trucks travelling on rails below the cooling chambers.




A Swiss Coke-Cooling Plant.

According to this invention, the cooling chambers C are connected to the generators E by conduits R, each provided with valve-controlled connecting pipes S. With such an arrangement it is possible, when one of the cooling chambers is not in operation, to heat the generator normally supplied with heat from such cooling chamber by placing the generator in question in communication with the adjacent cooling chamber; and *vice versâ*. In the particular plant shown, the generators and cooling chambers are arranged in groups, and there is no means illustrated whereby the elements in one group can be connected to those of the other group. Such grouping, however, is not essential to the invention.

## Bye-Product Producer-Gas Process.—No. 188,607.

BESWICK, W., of The Power-Gas Corporation, Ltd., of Stockton-on-Tees, and RAMBUSH, N. E., of the same address.

No. 5118; Feb. 21, 1922.

The object of the present invention is an improved process for the manufacture of producer gas with the simultaneous recovery of high yields in bye-products, such as ammonia and/or low-temperature distillation products.

The invention provides a process for operating a bye-product producer-gas plant in such a manner that the produced gas contains a percentage of carbon dioxide and carbon monoxide approaching that of gases usually only obtainable in the manufacture of ordinary producer gas—*i.e.*, without bye-product recovery—and having a calorific value of about 170 B.Th.U., as compared with about 135 B.Th.U. hitherto obtainable while recovering the maximum yields of products. The process consists in so controlling the temperature of the upper zone of the charge (without the necessity of building producers with special retorts and without the use of external cooling means, such as water-jacketing, or air cooling) that the gases leave the upper zone at a temperature of 150° to 300° C.

For thus controlling the temperature of the upper zone, the whole or part (properly regulated) of the gases generated in the lower part of the producer is caused to pass through the column of descending fresh fuel of such a depth (which for bituminous coal may reach or exceed 14 ft.), that sufficient heat is given off by the gases to effect stage-wise the practically complete low-temperature distillation of the fresh fuel; thereby reducing the temperature of the gases within the above-defined limits. To carry this out, it may be necessary to remove part of the gases generated in the lower zone prior to their reaching the upper zone.

There may also be a central off-take, situated within, near, or at the top of, the upper fuel zone, in such a way that the ascending gases are distributed as evenly as possible over the cross-sectional area of the column of the descending fresh fuel throughout its height. One way of effecting this distribution of the ascending gases is to arrange a bell at such a level that its mouth is situated at about, or slightly below, the normal level of the surface of the fuel bed, the mouth having an area smaller than that of the surface. The gas off-take springs from this bell.

By this improved process, it is possible to obtain a good yield of low-temperature distillation products and sulphate of ammonia, and the consumption of steam can be reduced to approximately 1 lb. or less of steam per lb. of fuel, instead of 2½ lbs. of steam per lb. of fuel, as is at present general in the bye-product producer-gas process. An additional advantage is that cumbersome and expensive superheaters for the blast are obviated.

## Gas Controllers.—No. 189,476.

THE HORSTMANN GEAR COMPANY, LTD., and HORSTMANN, A., both of Bath.

No. 14,932; May 30, 1921.

This invention relates to gas controllers and the like of the type which are driven by clockwork mechanism and in which manual adjustment is required, at greater intervals than one day, for the lighting and extinguishing of street lamps, &c. The object is to incorporate certain improvements rendering them more efficient by enabling the clockwork mechanism to be removed or put out of operation in case of restricted lighting or other cause, without the aid of a skilled mechanic, or without incurring waste of gas consequent upon the unscrewing of the gas cock.

According to the invention, the clockwork portion and the gas cock or interrupter portion are made in two separate and self-contained units; and no loose supplementary parts are required to unite them in an operative manner. Further, each part being interchangeably made, any clockwork portion of a given type can be instantly attached in an operative manner and secured to any other gas cock of the same type by an unskilled attendant; the gas cock with its attendant burner and/or fittings remaining permanently in the lamp when the clockwork mechanism is removed.

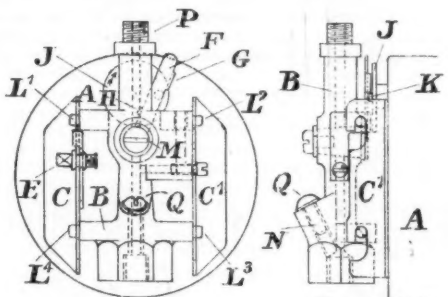


Fig. 1.



Fig. 2.

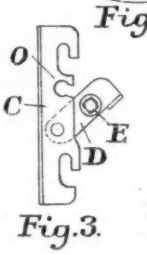


Fig. 3.

Fig. 4.

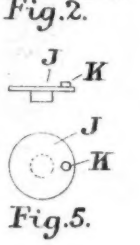


Fig. 5.

**Improvements to the Horstmann Controller.**

The invention may be carried into effect in various ways. The several instances described and illustrated in considerable detail in the specification are best suited to the Horstmann controllers in use; but the invention is applicable to other designs of gas controllers or electric switches.

When the clockwork portion is of the kind where the power is transmitted to the gas cock through a spindle protruding through the back of the case, the method seen in figs. 1 to 5 is adopted. In this controller (which consists of modifications of patents Nos. 23,161/09 and 27,290/05), the clockwork mechanism A is provided with a spindle protruding through the case, which carries a disc J on which is eccentrically mounted the pin K. There are also two hook plates C and C¹ (fig. 1) attached to the clockwork portion.

The gas cock portion B is a separate and distinct unit and is provided with four pivot-shaped lugs L¹, L², L³, and L⁴ protruding from the side extensions of the gas cock. The plug M (which forms the gas valve) has an attached lever F on which are two pallets G and H. When the disc J rotates in the direction of the arrow (fig. 1) half of a complete revolution, the pin or stud K, coming in contact with the pallet G, moves the lever F to the position shown in fig. 1 leaving F free to be operated by hand if desired, and the stud K free of the pallet G in the position shown. When the disc J has made another half revolution, the opposite movement is effected by the pallet H when the lever is moved to the opposite position and again left free for hand operation. It will thus be seen that the clockwork portion A can be instantly hooked on the gas cock portion B by the hook plates C and C¹; the eccentric stud K being always in the position free of the pallets G or H, and picking up its right rotation when set in motion by the clock at predetermined times. In fig. 3 will be seen the locking device D, shown in the drawing in the open position, allowing the clockwork portion to be hooked on to the gas cock, when it can be closed so that the key screw E goes into the recess O, and when screwed home prevents it from being unlatched without the aid of the key. The latch D can, however, be used as a securing device without the key screw E. It will be seen that the gas cock portion can be fixed in position inside the street lantern or elsewhere without the clockwork portion being attached, and the clockwork portion can be added at any time desired.

There is also provided, when required, a hole N furnished with a screw Q for clearing the service of salts or other foreign matter.

The specification also claims a further improvement in providing the operating levers, which determine the times at which the switch functions, with self-contained means for rendering them inoperative. This is effected by means of a spring-actuated hinged extension of the levers.

## Light-Giving Bodies for Incandescent Lighting. No. 189,492.

TERRELL, T., of Muswell Hill, and MONARCH MANTLES, LTD., of Leyton.

No. 20,596; Aug. 2, 1921.

This invention is for improvements in refractory materials for very high temperatures, which can also be used as light-giving bodies for incandescent lighting. Objects of the invention are to provide an improved refractory material, and incandescent bodies of thoria and ceria for illuminating purposes without the use of cotton, ramie, or other cellulose yarn or fibre.

The patentees have found that it is unnecessary and undesirable to use extremely fine powder; but employ an "ordinary degree of fineness," wherein the particles of the powder are not smaller than 0·01 mm.

In one method of carrying the invention into effect, 100 parts by weight of thorium oxide, preferably obtained from the ash of incandescent mantles, is mixed with 30 parts by weight of thorium nitrate, a small quantity of cerium salt—*e.g.*, its nitrate—and about one part by weight of the nitrates of magnesium, calcium, or other suitable hardening earths. This mixture is ground to an ordinary degree of fineness and moistened with a small quantity of alcohol or other volatile liquid, to convert it into a thick paste. Any inert liquid which merely wets the powder is suitable. The mixture is then moulded as required, and upon heating is converted into a hard coherent body, which will withstand very high temperatures, and which is suitable for use as a light-giving body—for example, by heating it to incandescence by high-pressure gas or by an oxy-acetylene flame.

The initial mixture may be modified by the addition of up to 30 parts by weight of powdered carbon prior to forming the mixture into a paste; and in the final heating the carbon is burnt out so as to leave a comparatively porous structure.

An important use of this process, say the patentees, lies in the manufacture of pastilles for oxy-acetylene lamps; but the material is also particularly suited for use as a furnace lining, or even as crucibles and the like, owing to its very highly refractory nature.

The mixture may in another application of the invention be suspended in collodion and dried in sheets, which can be made up into any desired shape, such as a gas-mantle. Upon ignition they produce a fine coherent sheet of thoria and ceria for use as an illuminating surface; a special advantage being that such sheets do not show any appreciable shrinkage upon ignition. Similarly, the mixture may be suspended in nitro-cellulose (artificial silk) or other suitable material, and squirted in the form of threads, which can be knitted or woven to form a gas-mantle.

## Lighting Controllers.—No. 189,547.

SOUTH METROPOLITAN GAS COMPANY and HARRIS, H. W., both of Old Kent Road, S.E. 15.

No. 23,287; Sept. 1, 1921.

This invention relates more particularly to improvements in apparatus described in specifications Nos. 9552 of 1903 and 14,879 of 1904, in which there is described mechanism whereby a gas tap is turned on or off by a spring-actuated motor which is released at predetermined times by a clock.

Two forms of apparatus are described; but in both forms the motor train is highly geared, with the result that little pressure is exerted by the wheel of the motor train, which is held in check by a detent. Consequently but little force has to be exerted by the clock to free the detent and release the motor train; but the turning on or off of the gas tap takes a considerable time. This feature is disadvantageous if employed to actuate certain types of burners now in use, as there is danger of lighting-back.

The main object of the invention is to improve the apparatus referred to and render it more convenient and efficient. A spring motor having a small train and a powerful spring is employed, so that the tap or switch is turned off comparatively quickly—in a second or even less. This motor is released at predetermined times by a clock, the axes of the motor and clock mechanism being parallel and the whole apparatus enclosed in a case which takes up but little room and is consequently of such size as to be suitable for placing above the base of a street lamp without causing too much shadow.

Owing to the fact that a strong spring and a small train of wheels is employed in the motor considerable pressure is exerted on the detent

(which holds the motor train in check) and so a comparatively large amount of force is necessary to free the detent. If a clock is to keep good time, it is desirable that the spring employed to drive it shall be but slightly more powerful than is actually necessary to drive the clock mechanism. Consequently the spring of such a clock has but little surplus power for doing extra work such as the removing of the detent in the motor referred to; and the patentees claim to provide means to lessen the force required to effect the releasing of the motor.

## APPLICATIONS FOR PATENTS.

**[Extracted from the "Official Journal" for Dec. 29.]**

Nos. 34,406 to 35,101.

ABBOTT, R. H. S.—"Apparatus for distillation of liquids containing carbonaceous matter." No. 34,750.
COX, W.—"Prepayment gas-meter." No. 34,937.
DAVIES, W. E.—"Carbonization, &c., of fuels containing bituminous matter." No. 34,832.
DAVIES, W. E.—"Carbonization of bituminous materials." No. 34,833.
DAVIES, W. E.—"Carbonization or gasification." No. 34,965.
EWART, J. W.—"Valves of water heaters." No. 35,028.
GIBB, D. M.—"Regulators for atmospheric burners." No. 34,878.
GLOVER, W. R.—"Coin-freed gas-meters." No. 34,973.
GLOVER & CO., LTD., G.—"Prepayment gas-meter." No. 34,937.
GLOVER & CO., LTD., T.—See Glover, W. R. No. 34,973.
GOODCHILD, P. W.—See Abbott, R. H. S. No. 34,750.
HACKFORD, J. E.—"Production of oil gas." No. 34,628.
HOLLINGS, W. W.—"Heat-interchangers for regeneration, &c., of gas." No. 35,043.
JOHNSTON, W. A.—"Temperature-controlled valve." No. 34,864.
KITSON ENGINEERING COMPANY (LONDON), LTD.—"Vapour lamps." No. 34,951.
KITSON ENGINEERING COMPANY (LONDON), LTD.—"Burners for gaseous fuel." No. 34,952.
KNIGHT, A.—"Prepayment gas-meters." No. 35,059.
LLOYD, J. H.—See Knight, A. No. 35,059.
MARSHALL, F. D.—"Distillation, &c., of carbonaceous, &c., materials." No. 35,020.
NEATH, J.—"Manufacture of gas." No. 34,452.
NOBLETT, A.—See Kitson Engineering Company (London), Ltd. Nos. 34,951 and 34,952.
PARKINSON STOVE COMPANY, LTD.—"Gas-regulators for atmospheric burners." No. 34,878.
PARRISH, P.—"Distillation of ammoniacal liquors." No. 34,479.
PREMIER GAS ENGINE COMPANY, LTD.—"Piston-cooling arrangements." No. 34,956.
RICHARDS, W. E. W.—"Treatment of coal tar." No. 34,642.
SILUMINITE INSULATOR COMPANY, LTD.—See Richards, W. E. W. No. 34,642.
SOUTH METROPOLITAN GAS COMPANY.—See Parrish, P. No. 34,479.
STAPLES, C. W.—See Glover & Co., G. No. 34,937.
TWIGG, C. H.—"Incandescent gas-burners, &c." No. 34,694.
WEIGHT, O. W.—See Parrish, P. No. 34,479.

# LEGAL INTELLIGENCE.

## SECURITY FOR A SUPPLY OF GAS.

At Aldershot Police Court, an application was made on behalf of Mr. R. J. Snuggs, in a dispute between that gentleman and the Aldershot Gas, Water, and District Lighting Company. It was pointed out, on his behalf, that under the Gas-Works Clauses Act the Company, when attaching any consumer's house to the mains, were entitled to ask for certain security; and if there was any dispute between the Company and the consumer as to what was a reasonable security and the nature or amount of it, the dispute must be settled by two Justices. For the Company, it was urged that this applied only to the amount.

Mr. PERCY ST. GERRANS, who appeared for Mr. Snuggs, said the only difficulty was one of the construction of the Act of Parliament; and the issue on facts was very short. On Dec. 18 Mr. Snuggs served a notice on the Company under section 11 of the Gas-Works Clauses Act, 1871, calling upon them to supply gas to his premises, and offering as guarantors the names of Alderman N. Solomon and Mr. F. Bateman. To this the Company replied that it was their invariable practice, as permitted by section 16 of the Act, to take security by way of cash deposit; and they could not see their way to depart from such practice with any individual. The question was one involving a principle and precedent, which they were not disposed to concede. He contended that the Company had no power to select the form of security, and pointed out that the Act said: "Such security may be by way of deposit or otherwise," which meant what any business man would regard as security. Surely if two guarantors were solvent, that was a security. The Company only required a deposit of £3, which, in effect, said they could not accept the security of two guarantors for £3. This showed the arbitrary standpoint assumed by the Company.

Mr. NORMAN CLINTON, for the Gas Company, said that all they asked was that the terms of the Act might be complied with. It was for the Company to say whether the security should be by deposit or otherwise; and there was nothing in the Act that gave the Magistrates any authority over what form the security should take. Their only jurisdiction was over the amount of security.

The CHAIRMAN (Mr. F. H. Birch) said the Bench were of opinion that, under section 16, their jurisdiction was limited to fixing the amount payable by the applicant; and as this had been agreed at £3, they had no further question to decide. The Magistrates awarded the Company the Court costs.

# MISCELLANEOUS NEWS.

## GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade under the Gas Regulation Act.

**Builth Gas and Coke Company, Ltd.**

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. 1d. per therm.

### SPECIAL ORDER.

**Weston-super-Mare Gas Light Company.**

Application is to be made by the Company to the Board of Trade for a Special Order under section 10 to enable them to establish a profit-sharing scheme, to relieve them from the obligation to hold more than one meeting in any year, and to authorize them to pay interim dividends.

### DECLARATIONS OF CALORIFIC POWER.

**Broadstairs Gas Company.**—470 B.Th.U. (March 28)
**Frodsham Gas and Water Company.**—500 B.Th.U., in substitution for 470 B.Th.U. (April 1.)
**Seaham Gas and Lighting Company.**—530 B.Th.U. (Dec. 23.)

## GAS REGULATION ACT ORDER.

The Director of Gas Administration has forwarded a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

**Calne Corporation.**

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 19·2d. per therm.
Prepayment meter clauses are included. (Dec. 21.)

## TEN YEARS' LIGHTING CONTRACT AT NEWMARKET.

Tenders for ten years' street lighting having been advertised for, the Newmarket Urban District Council lately held a special meeting to consider the offers received. Mr. Hambling presented the report of a meeting of the Town Committee held that evening. A Special Committee had, he said, been appointed to go into this question, and a specification and conditions had been drawn up, on which tenders were asked.

Mr. F. A. Simpson, Engineer and Manager of the Electric Light Company, wrote that the question of town lighting had been considered by his Directors, and he was instructed to inform the Council that in view of the large capital outlay, of approximately £7000, they did not feel disposed to tender for the lighting of the town unless the Council could see their way to make arrangements to meet this expenditure themselves or repay the amount, with interest at 10 p.ct., extended over a period of ten years.

Mr. J. H. Troughton, the Manager of the Gas Company, wrote on behalf of his Directors enclosing their tender "A" for public street lighting for ten years by means of incandescent gas-burners at ordinary pressure—namely, 158 ordinary lamps at £4 9s. 7d. each, 9 large lamps at £8 18s. 8d. each, 28 ordinary lamps at £9 6s. 6d. each, and 7 large lamps at £18 13s. each, these latter corner lamps; the total being £1177 15s. 8d. Mr. Troughton offered an alternative tender "B" to supply with gas, light, and extinguish 179 ordinary lamps at £4 4s. each, and 35 ordinary corner lamps at £8 15s. 4d. each, for £1058 12s. 8d. This meant that the Council would have 28 smaller units much closer together than was proposed in tender "A" by means of 16 200 c.p. lamps; and, further, the Company would fit-up automatic lighting and extinguishing controllers in every lantern, and give the town a better-lighted High Street.

Mr. Hambling moved the Committee's recommendation that the Gas Company's tender "B" should be accepted.

Mr. Russell seconded, and the motion was carried.

Mr. Hambling said the conditions provided for a reduction in price (on the basis of the price of gas on Sept. 1, 1924), should the ordinary price of gas come down.

The new contract provides for 214 lamps, as against 160 now.

**Cheaper Gas for Shrewsbury.**—For a third time within a year, the Shrewsbury Gas Light Company are reducing the price of gas. The price for the coming quarter will be 1s. 2d. per therm, or 5s. 3d. per 1000 c.ft. There is a total reduction of over 20 p.ct. on the year.

**Gas-Workers' Wages.**—At a meeting of the Strabane (co. Tyrone) Urban Council, Mr. M'Curdy, of Belfast, appeared in support of a complaint by the Council's gas-workers to the effect that they had to work a 54-hour week for 42s. 6d., and that they had been deprived of their half-holiday. Such conditions, it was urged, did not prevail elsewhere. In reply, Mr. Perry denied that there was any attempt at "sweating," and said many of the men lived in the Council's houses at a rent of 1s. 9d. per week, while they had other advantages that were not enjoyed by gas-workers elsewhere. After discussion, it was decided that the matter should be gone into further.

## SULPHATE OF AMMONIA PRICES.

### Spring, 1923.

In stating to fertilizer manufacturers, agricultural merchants, and co-operative societies the price at which they are prepared to book orders for sulphate of ammonia for home agricultural use for January and February, the British Sulphate of Ammonia Federation, Ltd., say:

As attempts have been made to buy supplies at the home price and to resell for export, please obtain a guarantee from your buyer that he will use the sulphate of ammonia you sell to him, on his own farm. Quantities bought at the home price stated below, which is considerably under the export price, may not be exported under any circumstances. Our contracts will contain a clause binding buyers to pay to us a large additional sum per ton in respect of any quantities exported.

The unit value of nitrogen in the price stated below for neutral quality is about 16s., and corresponds to a price of about £12 10s. per ton for nitrate of soda. When the price of nitrate is £13 per ton at British ports, sulphate of ammonia is worth well over £18 per ton delivered.

The bulk of our deliveries will henceforward be of neutral quality; but we reserve to ourselves the option of delivering ordinary quality in some districts, subject to the allowances in price stated below.

We are reserving the whole of our March and April production for home use; but this quantity will not be sufficient to meet a normal demand.

We still have limited quantities available for December delivery at 5s. per ton less than the price stated below.

We offer to sell sulphate of ammonia for home agricultural use at the following prices:

*For January and February delivery*, 1923.

£16 18s. per ton for neutral quality in fine friable condition, free from lumps, basis 25¾ p.ct. ammonia.

Delivered to consumer's nearest station or wharf in Great Britain for prompt cash payment, in lots of 4 tons and upwards.

Limited quantities of ordinary quality will be available in some districts, and will be sold at 23s. per ton less than the above prices, basis 25¼ p.ct. ammonia.

Neutral sulphate of ammonia as described above, guaranteed not to contain more than 0·025 p.ct. free acid, will be sold on the basis of 25¾ p.ct. ammonia, with no charge if over 25¾ p.ct, but with a graduated allowance per cent. if the content of ammonia is under 25¾ p.ct.

A further allowance of 9s. 6d. per ton will be made should the content of free acid exceed 0·025 p.ct., and an allowance of 9s. 6d. per ton will also be made should any delivery of neutral sulphate not be in fine friable condition free from lumps.

Ordinary sulphate of ammonia will be sold on the basis of 25¼ p.ct. ammonia, with no charge if over 25¼ p.ct., but with a graduated allowance per cent. if the content of ammonia is under 25¼ p.ct.

If ordinary sulphate is grounded, pulverized, or otherwise rendered free from lumps at buyers' request, an additional charge of 7s. 6d. per ton will be made.

## MAIN LEAKAGE CAUSES THREE DEATHS.

Owing to an escape of gas from a gas-main during Thursday night in Gale's Gardens, Bethnal Green, three persons—a father, mother, and son, named Holloway—were suffocated in their sleep, and seven persons were removed to hospital suffering from severe gas poisoning. In addition, about thirty persons were affected, and many of them had to receive medical treatment.

Gale's Gardens is a narrow, stone-paved thoroughfare, containing a number of small tenements occupied by working-class people. It appears that the gas-main under the roadway leaked; and as the gas could not escape through the stone paving, it penetrated the houses on either side of the road. The Holloway family, who did not burn gas, were found dead in their beds by an employee of the Gas Company, who, in view of the escape of gas, was knocking-up all the occupiers of the houses. Receiving no reply, he opened a front window and entered.

**Reduction at Clitheroe.**—A reduction of 4d. per 1000 c.ft. in the price of gas was sanctioned by the Clitheroe Corporation on Dec. 20. The reduction came into operation on Christmas Day.

**Price Reduced at East Cowes.**—The Directors of the East Cowes Gas Company announce that, as from the reading of the meters at Christmas, the price of gas will be reduced by 1d. per therm—from 1s. 3d. to 1s. 2d. This is equivalent to a concession of 4½d. per 1000 c.ft.

**Matlock Bath Gas Prices.**—The Gas Committee reported at a meeting recently of the Matlock Bath Urban Council that during the past year the quantity of gas made, when compared with the previous year, showed an increase of 28 p.ct. The report was considered satisfactory; and it was resolved to reduce the price of gas 3d. per 1000 c.ft.

**The Exhauster House Explosion at Beckton.**—An inquest was opened at West Ham last Wednesday on the body of Edward Taffs, an engine fitter, who died in hospital from a perforated gastric ulcer. He was one of about a score of men who were injured in an explosion in connection with a new set of turbo-exhausters under trial at the Beckton Gas-Works. It was, however, stated that, though the explosion might have aggravated the ulcer, it had nothing to do with the cause of death. The remaining injured men were stated to be progressing favourably, but not yet able to attend; and, after hearing evidence from Mr. W. B. Leech and Mr. F. M. Birks, the Coroner adjourned the inquiry for a fortnight, in order to get further information. Mr. Leech said that there were signs of heating on one part of the machine; but he doubted if this was sufficient to cause the explosion, unless a spark occurred.

## CEARÁ GAS COMPANY.

### Adverse Conditions.

The Annual General Meeting of the Company was held on Thursday last, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. F. W. BROTHERS (the Chairman) presiding.

The SECRETARY (Mr. E. Pratt) read the notice convening the meeting; and the report and accounts for the year ended June 30 last were taken as read. The report stated that the loss on the working was £2658 10s. 10d. A sum of £3000 had been transferred from reserve account, and £848 12s. 7d. remained to be carried forward. Exports from Ceará of cotton, hides, and wax showed improvement for the first five months of 1922, but with values very much below those of previous years. The financial condition of the State remained practically unchanged, though an attempt had been made to enforce economy. The amount owing by the State Treasury for the street lighting at June 30 represented fifteen months' accounts. Therefore nothing could be said at present regarding debenture interest overdue.

The CHAIRMAN, on rising to address the meeting, said he would like to preface his remarks by expressing their deep regret at the loss of their old and esteemed colleague on the Board, Mr. Fred. E. Linging. He had been in bad health for some time, and died on Nov. 19. Proceeding to move the adoption of the report and accounts, he remarked that they were the fourth under post-war experience. Regarding the revenue figures before them, there was little to say. Gas rental was about the same as in 1921, but residuals were £1500 less. On the expenditure side, coal and expenses were £743 less, while other costs showed little change. The item of exchange was only £985, though the value of the currency had been lower during the year than any previously recorded. It was explained by the smallness of the remittances. There was, he was afraid, little hope of improvement in the current year. Payments by the State Treasury might only be regarded as most uncertain. All that might be hoped was that it would be possible to rub along for another year. The financial condition of the State gave little hope of a loan being raised, at all events of a sufficiency to pay off all creditors. For these reasons, they would see how impossible it was to give a forecast about debenture interest, or the second debenture principal, the term of which expired at June 30. Last year, they might recollect, an outline was given of some of the difficulties experienced during 1920-21. The new system of Customs collection on "*expediente*" on coal caused considerable concern to companies of public utility, and to users of coal generally throughout Brazil for steam, power, and gas purposes. The object of imposing a prohibitive duty was believed to be with the idea of fostering certain coal deposits found in a Southern State, the exact nature of which had not yet been, he might say, revealed. The inference was, therefore, that what little coal might be available bore no comparison with the characteristic properties of British coal, nor with the good qualities of those from the United States of America. As the high duty imposed was found to be a rod for the backs of Brazilian steamship companies and native users generally, this scare did not last long, and collection was made on the former basis. Companies of public utility were aided on inception by the Imperial Government 65 years ago, and since by the Republic up to 1912, by the privilege of freedom from duties on materials required annually for the carrying-out of railway, water, and gas services, and in later years traction, electric light, and power systems. This Company's experience was satisfactory from 1867 to 1888, when the annual free list of materials required was negatived by the then Finance Minister. The Commercial Department of the Foreign Office forwarded this Company's case to the British Minister at Rio de Janeiro, resulting in the privilege being restored, and eventually the return of full duties levied. Deducting Customs officials' percentages, &c., the yield was about 60 p.ct. of the amount overpaid. No further trouble happened until 1912-13, when the excess of national expenditure over receipts caused a tightening-up of fiscal machinery. The Finance Law of Dec. 31, 1912, cancelled all duty-free privileges. Though this enactment was understood to be not retrospective, most companies of public utility appeared to have been mulcted in full duty since. About the month of March, it appeared, a special Customs Commission set out from Rio de Janeiro to all ports, to examine free entries from 1912. In October last, a demand was made on this Company in Ceará for full duties in 1911, 1912, and 1913, which was expected to total a considerable amount. In 1912-13, on the Customs duties privilege being negatived, an advocate in Rio de Janeiro entered an action. A decision, in first instance, was given on a technical point—that "one year had expired before the documents in the case arrived from Ceará." A further motion was made when, in June last, appeal was reached, the decision being against the Company. This matter having reached the final stage, the time should now be appropriate for the British Embassy to look into it, as also into the back duties demand. Coal and freight were likely to be less costly next year, the benefit of which should be felt, if sufficient money came along to provide them. Exports from the State of Ceará in volume were normal, but in value not half that of three years ago. This, with the great fall in exchange, was a most unfortunate combination. Payment by the State for street lighting might be difficult for another year. The President of the State, a few months ago, wanted the lighting reduced beyond the limit at which it could be continued. Agreement not having been reached, it remained as it was for the present. It was hoped that better results might be possible in the current year. In conclusion, he must refer again to their indebtedness to their Engineer and Manager (Mr. W. A. Valon Watson) in his uphill fight against all sorts of adverse conditions for some years past. The thanks of the debenture holders, as well as of the shareholders, were due for his great all-round efforts in keeping the concern alive. Be the circumstances what they might, it was difficult to conceive better services than those already given; and the Directors felt sure that Mr. Watson might be relied upon to do all that was possible even unto the end.

Mr. T. M'MAKING seconded the motion, which was agreed to.

Mr. Charles Webb was re-elected a Director, on the proposition of the CHAIRMAN (who referred to the great value to the Board of Mr.

Webb's financial experience), seconded by Mr. M'MAKING; and the Auditor (Mr. W. J. Wright) was re-appointed, on the proposition of Mr. F. W. CHURCH.

The CHAIRMAN proposed a hearty vote of thanks to the Engineer and staff in Ceará and the Secretary in London. He stated that they were well and loyally served all round.

Mr. WEBB, in seconding, said it was gratifying to know that they had a set of officials who had the interests of the Company thoroughly at heart.

The resolution was carried, and acknowledged by Mr. PRATT.

A vote of thanks, proposed by Mr. CHURCH, to the Chairman and the Directors, for the very able manner in which they had carried out their duties in difficult times, concluded the proceedings.

## SOUTH BARRACAS GAS COMPANY.

The Thirty-Second Ordinary General Meeting of the South Barracas (Buenos Ayres) Gas and Coke Company, Ltd., was held at the London Offices, No. 287, Dashwood House, New Broad Street, E.C., last Friday, when the report was submitted, particulars from which were given on p. 812 of last week's "JOURNAL."

The CHAIRMAN (Mr. F. C. im Thurn), in moving the adoption of the report and accounts, pointed out that the latter were for the period of six months only. The Board wrote repeatedly for audited accounts for the six months to June, 1922; but there appeared to have been a misunderstanding between the Primitiva Company and the auditors in Buenos Ayres, and as these accounts did not arrive, it was decided to submit those for the six months to Dec. 31, 1921. The accounts before them were not comparable with the previous ones, because the latter were for a period of eighteen months, and, in addition, the whole period since May 1, 1920 (the date upon which the Primitiva Company took over), had seen this Company in a state of transition. Notwithstanding this, the accounts under review were the first ones since 1916 to show even a small working profit in South Barracas. This small profit was, of course, swallowed-up many times over by the large interest charges. With regard to the agreement with the Primitiva Company, they undertook to run the business at a time when the Barracas Company could not continue through lack of funds. The Primitiva Company had kept the business going, thereby conserving the value of the property. At Dec. 31, 1921, they owed the Primitiva Company some £21,339. At the last meeting, he told them of the provisional arrangements made whereby troublesome local creditors were to be settled with. These arrangements necessitated the sale of assets, the only possible way of raising ready money; and the sales in question were authorized by the two classes of debenture stockholders at meetings held in December, 1921. The sales were not completed until after the date of the accounts now submitted; but the next accounts would deal with them. These sales would result in a loss; but they had to remember that they were left with a going concern, and the alternative would probably have been law suits all round.

The supply of gas had now been resumed in almost all the Company's districts; but business would be slow in coming back. They had to live-down the bad feeling created during the war, when coal was unobtainable, and they were supplying poor gas made from all sorts of substitutes. He was quite hopeful, however, that the business would slowly recover itself, because there was no doubt that the Company's districts were good ones, and once the population got over the prejudice he had mentioned, they would want gas—in fact, they did want it already. With regard to the general position, he was afraid he must repeat what he said a year ago—that, even if the business did recover, it was evident, from a perusal of the balance-sheet, that there was nothing in it for the shareholders. They must not think he made this statement lightly, or without consideration. On the contrary, he was interested from all points of view. He had gone thoroughly into the matter, and this was his opinion. So far as the two classes of stockholders were concerned, he thought the ultimate solution would be to form a Company with a smaller capital, to be divided between these two classes of stockholders, in some proportion yet to be decided upon—thereby cutting out not only the shareholders, but also the large unsecured creditors, who, of course, ranked before the shareholders. The obstacle at present was that they owed the Primitiva Company a large amount; and, naturally, they wanted to be settled with in cash. It was evident that they could not pay them enough cash out of profits, except over a very lengthy period. He did not think they would take shares in any new Company such as he had mentioned. The new Company would not want to issue debenture stock so early in its career, even if the Primitiva Company would take it; and the Company had no spare property which would realize the whole amount of the debt to them. All this was matter for arrangement; and they had not found a solution yet. He merely placed the position before them, so as not to raise the hopes of the shareholders, and so that the debenture stockholders would not be surprised if the Directors asked for permission to sell further assets.

The report and accounts were adopted without discussion.

**Bilston Gas Light and Coke Company.**—In the report presented at the annual meeting last Monday, the Directors stated that the profit and loss account, after paying the interim dividends, showed a credit balance of £16,332. It was proposed to pay further dividends of 5s. 6d. per share on the "A" shares and 4s. on the "B" shares, both less tax (making, with the interim dividends, 10s. 6d. and 7s. 6d. per share respectively, less tax, for the year). This will leave a balance of £14,318. The terms of the Company's Order under section 1 of the Gas Regulation Act (which has now been granted) are equitable to both the consumers and shareholders. During the year, owing to the reductions in the cost of coal and of manufacture, it has been possible to make some reduction in the price of gas, notwithstanding the comparatively low prices obtained for residual products.

## GAS PRICES REDUCED AT COVENTRY.

Mention was made in last week's "JOURNAL" of the fact that reductions in the price of gas had been approved by the Coventry City Council, on the recommendation of the Gas Committee.

Councillor CLEVERLEY (the Chairman of the Gas Committee), in moving the adoption of the recommendation that the revised scale of charges be operative as from the December readings of the meters, reminded the Council that this was the fourth occasion during the year on which the Gas Committee had been able to reduce the charges for gas. In the June quarter the price was reduced from 4s. 11d. to 4s. 8d., in the September quarter to 4s. 2d., and in the December quarter to 3s. 10d. The more stabilized position of the coal and residual markets, in conjunction with other economies effected, would, he said, result in such increased revenue as to justify the further reductions now recommended. It would be noticed that the Committee had adopted the principle of a discount for prompt payment of accounts, which had been under consideration for some time, as it was felt that the allowance of a discount would be an inducement to consumers to pay accounts earlier, thus obviating the necessity of sending reminders; and the money thus collected would be earning bank interest. The net result of the new scale was to give a reduction varying from about 4d. per 1000 c.ft. to the small consumer to about ½d. per 1000 c.ft. to the large industrial user. In order to encourage consumers who were taking nearly 4 million c.ft. per month further to develop the use of gas for industrial purposes, the scale of charges was extended to give an extra reduction when the consumption exceeded that quantity. The Council and the citizens of Coventry should be gratified to know that the new scale would make the charges for gas in Coventry the lowest in the Midlands.

The scale of charges is of interest, as showing the Coventry system of monthly accounts, if desired, for consumers who take over 1½ million c.ft. of gas per quarter.

*Price of Gas as from December Readings.*

QUARTERLY ACCOUNTS.

| Quantity per Quarter. | Revised Price per 1000 C.Ft. | Present Price per 1000 C.Ft. No Discount. |
|---|---|---|
| Up to 300,000 | 3/8 | 3/10 |
| 300,000 ,, 500,000 | 3/7 | 3/9 |
| 500,000 ,, 1,000,000 | 3/6 | 3/8 |
| 1,000,000 ,, 1,500,000 | 3/5 | 3/7 |
| 1,500,000 ,, 2,250,000 | 3/4 | 3/6 |
| 2,250,000 ,, 3,000,000 | 3/3 | 3/5 |
| 3,000,000 ,, 3,750,000 | 3/2 | 3/3 |
| 3,750,000 ,, 4,500,000 | 3/1 | 3/1 |
| 4,500,000 ,, 5,250,000 | 2/11 | 2/11 |
| 5,250,000 ,, 6,000,000 | 2/9 | 2/9 |
| 6,000,000 ,, 12,000,000 | 2/7 | 2/6 |
| Above 12,000,000 | 2/5 | 2/6 |
| | *Less 5 p.ct.* | |

MONTHLY ACCOUNTS.

| Quantity per Month. | | |
|---|---|---|
| 500,000 to 750,000 | 3/3 | 3/5 |
| 750,000 ,, 1,000,000 | 3/2 | 3/4 |
| 1,000,000 ,, 1,250,000 | 3/1 | 3/2 |
| 1,250,000 ,, 1,500,000 | 3/– | 3/– |
| 1,500,000 ,, 1,750,000 | 2/10 | 2/10 |
| 1,750,000 ,, 2,000,000 | 2/8 | 2/8 |
| 2,000,000 ,, 4,000,000 | 2/6 | 2/5 |
| Above 4,000,000 | 2/4 | — |
| | *Less 5 p.ct.* | |
| Prepayment | 4/– | 4/4 |
| Outside city and Foleshill Parish, extra. | –/6 | –/6 |

## LOW-TEMPERATURE CARBONIZATION, LTD.

### Gas Production Reform.—An Optimistic Speech.

The Annual General Meeting of the Company was held last Friday at the Victoria Hotel, London.

The CHAIRMAN (Sir Harry Brittain, M.P.) said: Since our circular of last July, the plant at Barnsley has been running continuously night and day for the last eighteen months. Certain important developments, however, proved to our engineers that they could see a way of greatly reducing the capital and the working costs—in fact, we understand that the capital cost of construction can be reduced by some 40 p.ct. and the labour costs by nearly 50 p.ct. on each ton of coal carbonized. In addition, not only is this improved retort self-filling and self-discharging, but it is continuous in its operation. Consequent on these improvements, it is only within the last few weeks that the Construction Company has been able to furnish the latest plans and specifications to some of the leading gas companies and colliery undertakings, embodying the latest cost and balance-sheet figures. It is agreed by the engineers and other experts that this improved plant is very far ahead of any carbonization proposition known to be in operation (either high or low temperature) in any part of the world. On account of the comparatively small capital outlay and the high yields of gas and smokeless fuel, our engineers have little doubt of its general adoption in gas-works, which should reduce the cost of gas to the consumer and increase automatically the stockholders' dividend.

The introduction of the therm will undoubtedly give a great stimulus to our developments; and I cannot do better than refer you to the Government Fuel Research Board's report, which draws particular attention to our constructive work in the field of low-temperature carbonization of coal, as well as to the advantage of utilizing low-temperature rich gas, which, they point out, should establish a hitherto unexpected link between the gas industry and low-temperature carbonization. As a result of these developments, we have recently been

approached by financial groups in the City of London, who are discussing with us an important proposal to finance the erection of carbonizing plants at gas-works, electricity undertakings, collieries, and other large fuel-consuming concerns throughout the country, on the remunerative lines pursued before the war, with high-temperature coke-ovens, which policy, backed frequently with foreign capital, achieved, as you are aware, such satisfactory financial results.

This concern is a great pioneer undertaking which has been formed to surmount innumerable difficulties; and we look forward to big financial results. We are engaged in the evolution of an economic industrial reform, no less vital than was the discovery of steam power over a century ago. The results of low-temperature carbonization alone can give independence in our liquid fuel supply in time of war.

The adjournment of the meeting to a future date was unanimously agreed to.

## TRADE NOTES.

**Valves for South African Railways.**

Messrs. J. Blakeborough & Sons, Ltd., of London and Brighouse, have recently received instructions to supply all the valves and circulating pipes required in connection with the electrification of the Glencoe-Pietermaritzburg section of the South African Railways.

**Gasification of Wood Fuel.**

Messrs. Crossley Bros., Ltd., of Openshaw, Manchester, and London, forward some interesting literature with regard to the gasification for power purposes of wood refuse, &c.—including a reprint from "The Engineer" of an article on "Wood Fuel Suction Gas Power Plant at the Lonely Mine, Southern Rhodesia," some particulars from which will be found on p. 627 of the "JOURNAL" for Dec. 6. The success of this installation of Premier gas-engines and Crossley wood refuse plants has been most pronounced—the saving, as against the old steam plant, amounting to over £3000 per month.

**Calendars and Pocket Books.**

From Simon-Carves, Ltd., of Manchester, we have received a very tasteful and clear block calendar. Similar contributions have come from Messrs. Brotherton & Co., Ltd., of Leeds, and Milner Hurd's Patents Co., Ltd., of Sheffield. A useful wall calendar has been supplied by Messrs. Peckett & Sons, Ltd., of Bristol. Well-bound pocket books are to hand from the Gas Meter Company, Ltd., of 238, Kingsland Road, London, E. 2, and from the Torbay Paint Company, of 26-28, Billiter Street, E.C. 3. A pocket book for Coke-Oven Managers has come to hand from the Semet-Solvay and Piette Coke-Oven Co., Ltd.

**Ramsgate Price Reduction.**—The price of gas at Ramsgate is to be reduced 5d. per 1000 c.ft.

## CURRENT SALES OF GAS PRODUCTS.

### Tar Products in the Provinces.

*Jan. 1.*

The average values for gas-works products during last week were: Gas-works coal tar, 72s. to 77s. Pitch, East Coast, 122s. 6d. to 127s. 6d. f.o.b. West Coast—Manchester, 117s. 6d. to 122s. 6d.; Liverpool, 118s. to 123s.; Clyde, 122s. 6d. to 127s. 6d. Benzole 90 p.ct. North, 1s. 8d. to 1s. 9d.; crude 65 p.ct. at 120° C., 1s. 0½d. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 9d. Toluole, naked, North, 2s. to 2s. 1d. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; salty, 6½d. to 7d. Scotland, 6d. to 6½d. Heavy oils, in bulk, North, 6⅝d. to 7⅛d. Carbolic acid, 60 p.ct., 2s. 4d. to 2s. 7d. Naphthalene, £15 to £16; salts, £5 10s. to £6 10s., bags included. Anthracene, "A" quality, 5d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

## FROM A MARKET CORRESPONDENT.

### Bye-Products Trade.

Many of the works have remained closed over the holidays, and there is still very little to report in the market for tar products. Pitch remains steady to strong at £6 per ton f.o.b. East Coast, and from £4 15s. to £5 10s. in other quarters. Crystal carbolic acid is another very fine spot at 8½d. per lb.; while crude acid is 2s. 2d. per gallon. Cresylic acid is 2s. 4d. to 2s. 6d. per gallon, and creosote 6½d. per gallon. Naphthalene is quiet, with crudes from £4 to £6, and refined at £14 to £17 per ton. Intermediate products are steady—the demand from the Continent being only small.

### Sulphate of Ammonia.

There is no change to report; production is still on the short side the world over, and prices must shortly be advanced.

**Development Work at Bournemouth.**—Some particulars of the Company's activities in supplying the rapidly increasing needs of their various districts are contained in the December issue of the Bournemouth Gas and Water Company's "Co-Partner" magazine. There are new houses going up on every hand; and the builders are almost as busy as they were in the days before the war. The following is a record of the work done by the Company during the past twelve months: Number of houses completed in the Company's area of gas supply, 322. Houses piped, 307. Cooker points run, 280. Lighting points run, 1577. Boiler points run, 54. Fire points run, 305. The value of the apparatus, fittings, &c., sold at the showrooms amounted to £31,500.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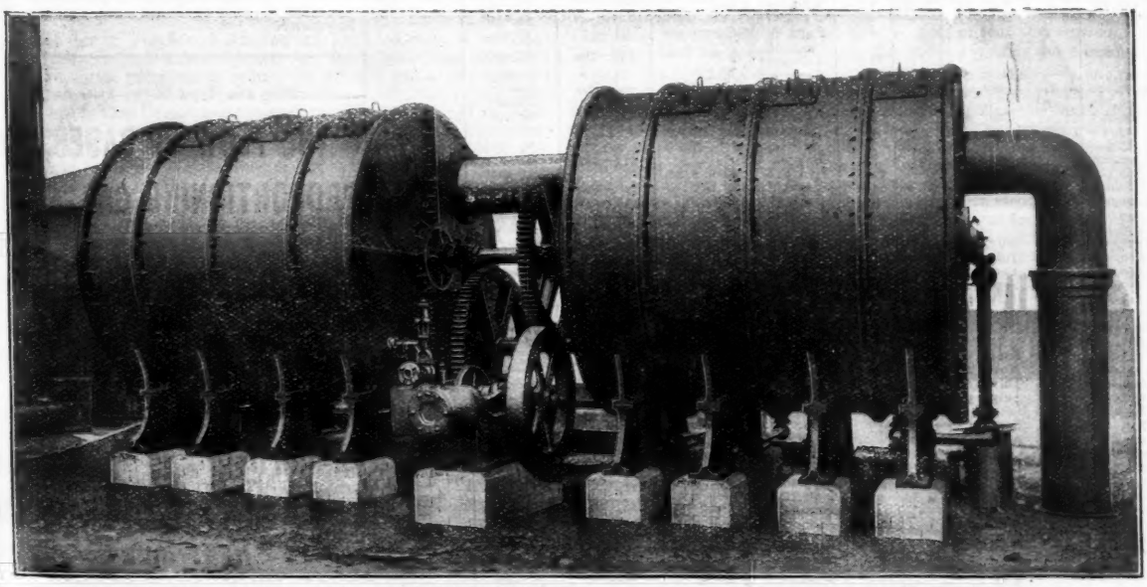

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# STOCK MARKET REPORT.

LAST week on the Stock Exchange was a short span of three days cut off from all continuity with normal conditions by holidays behind it and in front of it; but the most noticeable feature about it was that it was neither idle nor dull. On the contrary, the tone was cheery from start to finish, and not even the disagreeable hitch at Lausanne was taken very seriously. The gilt-edged market gave a good lead from the opening. Home Government issues were firm, and Home Rails showed fine strength. Argentines were steady.

The Foreign Market was not strong, and French, German, Turk, and Brazilian gave way. Thursday was to a great extent on Wednesday's lines. Home Government's (especially Bonds) were firm, and Indians were steady. The Foreign Market continued weak. Friday did well. The big four marked: Consols 55⅝-55¾, War Loan 99¹⁵⁄₁₆-100⅛, Funding 85⅞-86⅛, Victory 88⅛-88½. Home Rails were in strong demand.

Business in the Gas Market was very quiet and quite devoid of any salient feature. Prices were practically almost unchanged; variations in quotation being nearly all adjustments to *ex div.* conditions, especially in debenture issues.

The following transactions in gas during the week were recorded: On Wednesday, British 34¼, Croydon maximum dividend 82, 83, European 9½, Gas Light ordinary 94½, 95, Imperial Continental 158, San Paulo 6 p.ct. preference 5⅜, 5⅝, South Metropolitan ordinary 94½, 94⅝, Liverpool 7 p.ct. preference 106½, 106¼, 106⅜. On Thursday, Bombay 93s. 9d., 95s., Brentford "A" 100½, 100½, 101½, Cape Town 4½ p.ct. preference 7, Croydon maximum dividend 82⅜, 83¼, European 9⅛, Gas Light ordinary 94, 94¼, 94½, 94⅝, ditto 3⅛ p.ct. maximum 63½, ditto 4 p.ct. preference 78, ditto 3 p.ct. debenture 61, Primitiva 5 p.ct. preference 47s. 6d., 48s. 1½d., South Metropolitan 93⅜, 94, South Suburban 98½, Liverpool 7 p.ct. preference 105⅝, Hornsey 4 p.ct. debenture 79, 79½, Folkestone 77, 77½. On Friday, European 9⅛, 9⅜, Gas Light ordinary 94⅜, 94⅝, ditto 4 p.ct. preference 78, 78½, Imperial Continental 158, 159, Liverpool 7 p.ct. preference 106⅜, 106½, Primitiva 14s. 6d., ditto 5 p.ct. preference 48s., 48s. 6d., 48s. 9d., South Metropolitan 94½, ditto 6½ p.ct. debenture 105½, 106¼, Barnet "D" 89, 89½, Folkestone 77½.

In the Money Market, there was extreme animation and activity, and the varied demands were on a scale calculated to gratify the lenders. The ordinary requirements by way of short loans were at firm rates; but these were overshadowed by the array of borrowings from the Bank of England, which touched 3½ p.ct. There was not much doing in discount, and rates were rather easier. Silver made an appreciable recovery, being helped by a welcome demand from India which put 1d. on to the price. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

| Issue. | Share. | When ex-Dividend. | Ante-War Dividend & Bonus. | Last Dividend. | NAME. | Closing Prices, July 30, 1914. | Present Prices. | Lowest and Highest Prices of Transactions. |
|---|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | | |
| 182,049 | Stk. | Aug. 24 | 4 | 4% | Aldershot 4 p.c. Pref. | .. | 68—73 | ... |
| 1,551,868 | ,, | Oct. 5 | 2½ | 5% | Alliance & Dublin Ord. | 59—64 | 62—67 | ... |
| 374,000 | ,, | July 13 | 4 | 4% | Do. 4 p.c. Deb. | 76—79 | 60—65 | ... |
| 280,000 | 5 | Oct. 19 | 7½ | 4/- | Bombay, Ltd. | 5⅛—6⅛ | 4⅛—5 | 93/9—95/- |
| 100,000 | 5 | Aug. 10 | 16 | 7½% | Bournemouth Gas and Water (5 p.c. B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.) | .. | 11—12 | ... |
| 383,110 | 10 | ,, | 7 | 7% | | 15—15⅛ | 11—12 | ... |
| 115,000 | 10 | ,, | 6 | 6% | | 13⅛—14 | 9—10 | ... |
| 162,065 | — | Dec. 29 | — | 4% | | .. | 71—76* | ... |
| 992,045 | Stk. | July 27 | 14 | 6/- | Brentford A Consolid. | 261—266 | 100—103 | 100⅛—101½ |
| 734,920 | ,, | ,, | 11 | 6/3 | Do. B New | 204—209 | 100—103 | ... |
| 55,000 | ,, | ,, | 5 | 5% | Do. 5 p.c. Pref. | 109—111 | 82—87 | ... |
| 221,400 | ,, | Dec. 14 | 4 | 4% | Do. 4 p.c. Deb. | 91—93 | 75—80 | ... |
| 214,775 | ,, | Aug. 24 | 11 | 11% | Brighton & Hove Orig. | 208—213 | 165—170 | ... |
| 244,200 | ,, | ,, | 8 | 8½% | Do. A Ord. Stk. | 154—159 | 120—125 | ... |
| 1,287,500 | Stk. | July 28 | 5 | 5% | Bristol 5 p.c. max. | .. | 89—91 | ... |
| 530,000 | 20 | Oct. 5 | 12½ | 22/6 | British | 44—45 | 32—34 | 34½ |
| 10,000 | 10 | Dec. 29 | — | 7/- | Do. 7 p.c. Pref. | .. | 9⅞—10⅜* | ... |
| 120,000 | Stk. | June 29 | 4 | 4% | Do. 4 p.c. Deb. Stk. | 88—90 | 75—80 | ... |
| 245,771 | ,, | Dec. 29 | 4 | 4% | Buenos Aires 4 p.c. Deb. | 85—87 | 53—58* | ... |
| 100,000 | 10 | Nov. 2 | — | — | Cape Town & Dis., Ltd. | 1½—2½ | 6½—7½ | ... |
| 100,000 | 10 | Oct. 19 | — | — | Do. 4½ p.c. Pref. | 4—6 | 6—7 | 7 |
| 100,000 | Stk. | Dec. 29 | 4½ | — | Do. 4½ p.c. Deb. Stk. | 70—75 | 71—76* | ... |
| 237,865 | ,, | ,, | — | 7½% | Cardiff 7½ p.c. Deb. | .. | 102—104* | ... |
| 157,150 | ,, | Feb. 26 | 5 | 5% | Chester 5 p.c. Ord. | 108—110 | .. | ... |
| 1,513,280 | ,, | July 27 | 5/9/4 | 56/- | Commercial 4 p.c. Stk. | 106—108 | 93—98 | ... |
| 560,000 | ,, | ,, | 5½ | 55/- | Do. 3½ p.c. do. | 103—105 | 93—98 | ... |
| 475,000 | ,, | Dec. 14 | 3 | 3% | Do. 3 p.c. Deb. Stk. | 69½—71½ | 55—60 | ... |
| 800,000 | ,, | Dec. 15 | 4 | — | Continental Union, Ltd. | 76—79 | 26—31 | ... |
| 200,000 | ,, | Dec. 14 | 7 | 3% | Do. 7 p.c. Pref. | 115—118 | 52—57 | ... |
| 660,000 | | Sept. 1 | — | 6% | Croydon sliding scale. | .. | 96—101 | ... |
| 284,975 | | ,, | — | 5% | Do. max. div. | .. | 80—85 | 82—83½ |
| 492,270 | Stk. | ,, | 6 | 4½% | Derby Con. Stk. | 123—125 | .. | ... |
| 55,000 | ,, | — | 4 | 4% | Do. Deb. Stk. | 102—104 | .. | ... |
| 209,000 | ,, | Oct. 5 | — | 5% | East Hull 5 p.c. max. | .. | .. | ... |
| 1,002,180 | 10 | July 14 | 10 | 5/0 | European, Ltd. | 17⅛—18 | 9⅛—10⅛ | 9⅛—9⅜ |
| 16,298,975 | Stk. | July 27 | 4/17/4 | 52/- | Gas Light and Coke (4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds 7½ p.c. Ilford Deb.) | 98—102 | 94—96 | 94—95 |
| 2,600,000 | ,, | ,, | 3½ | 35/- | | 76—79 | 62—65 | 63½ |
| 4,062,235 | ,, | ,, | 4 | 4% | | 96—99 | 76—81 | 78—78½ |
| 4,674,850 | ,, | Dec. 14 | 3 | 3% | | 72½—74½ | 59—62 | 61 |
| 130,000 | ,, | Dec. 11 | 10 | 10% | | .. | .. | ... |
| — | — | — | — | — | | .. | .. | ... |
| 82,500 | ,, | Sept. 21 | 5 | 65/7½ | Hastings & St. L. 5 p.c. | .. | 95—100 | ... |
| 258,740 | ,, | ,, | 3½ | 30/7½ | Do. 3½ p.c. | 87—89 | 77—80 | ... |
| 70,000 | 10 | May 18 | 11 | 7½% | Hongkong & China, Ltd. | 16½—16¾ | 6—7 | ... |
| 86,600 | Stk. | Aug. 24 | 9 | 9½% | Hornsey 7 p.c. | .. | 127—132 | ... |
| 1,976,000 | ,, | Nov. 16 | 9 | £5 | Imperial Continental | 150—160 | 155—160 | 158—159 |
| 404,800 | ,, | Aug. 10 | 3½ | 3½% | Do. 3½ p.c. Deb. Red. | 84—86 | 77—82 | ... |
| 235,242 | ,, | July 27 | 6½ | 6½% | Lea Bridge Ord. 5 p.c. | 119—121 | 95—100 | ... |
| 2,498,905 | ,, | Feb. 26 | 10 | 37/6 | Liverpool 5 p.c. Ord. | .. | .. | ... |
| 600,000 | ,, | Sept. 21 | — | 7% | ,, 7 p.c. Pref. | .. | 105—107 | 106⅜—106½ |
| 165,736 | ,, | Aug. 10 | 7/5/6 | 87/3 | Maidstone 5 p.c. | .. | 87—92 | ... |
| 63,480 | ,, | Dec. 29 | — | 3% | Do. 3 p.c. Deb | .. | 53—58* | ... |
| 75,000 | 5 | June 29 | 6 | 6% | Malta & Mediterranean | 4⅛—4¼ | 3¼—4 | ... |
| 250,000 | 100 | Oct. 2 | 4½ | 4½% | Met. of Melbourne 4½ p.c. Deb. | 99—101 | 97—100 | ... |
| 541,920 | Stk. | Nov. 30 | 4 | 4% | Monte Video, Ltd. | 11½—12 | 55—60 | ... |
| 1,875,892 | ,, | July 27 | 4½ | 4½% | Newcastle & Gatsh'dCon. | 98¼—99¼ | 75—80 | ... |
| 98,125 | ,, | ,, | — | 4% | Do. 4 p.c. Pref. Stk. | .. | 66—69 | ... |
| 529,705 | ,, | Dec. 29 | 3½ | 3½% | Do. 3½ p.c. Deb. | 82—83 | 63—68* | ... |
| 15,000 | 10 | Aug. 26 | — | 7/6 | North Middlesex 10 p.c. | .. | .. | ... |
| 55,940 | 10 | Aug. 24 | 7/14/0 | 7/8⅝ | ,, ,, 7 p.c. | 14—15 | 10½—11½ | ... |
| 300,000 | Stk. | Nov. 30 | 8 | 8% | Oriental, Ltd. | 117—122 | 95—100 | ... |
| 188,120 | Stk. | Dec. 29 | — | 72/6 | Plym'th & Stonh'se 5 p.c. | .. | 91—96* | ... |
| 60,000 | 50 | Aug. 24 | 13 | 65/- | Portsea Island, B | 128—131 | 100—105 | ... |
| 100,000 | 50 | ,, | 12 | 60/- | Do. C | 118—121 | 85—90 | ... |
| 249,980 | 5 | ,, | 8 | — | Primitiva Ord. | 5⅛—6 | 2 9/16—2 11/16 | 14/6 |
| 499,960 | 5 | — | 5 | — | Do. 5 p.c. Pref. | 4⅛—5 | 2¼—2½ | 47/6—48/9 |
| 521,600 | 100 | Nov. 30 | 4 | 4% | Do. 4 p.c. Deb. | 91—93 | 68—73 | ... |
| 600,000 | Stk. | July 27 | 4 | 4% | Do. ,, ,, 1911 | .. | 55—60 | ... |
| 346,198 | ,, | Dec. 29 | 4 | 4% | River Plate 4 p.c. Deb. | 85—87 | 53—58* | .. |
| 150,000 | 10 | Sept. 21 | 6 | 6/- | San Paulo (6 p.c. Pref. 5 p.c. Deb.) | 10⅛—11 | 5¼—6 | 5¼—5⅝ |
| 125,000 | 50 | July 3 | 5 | 5% | | 47—49 | 35—38 | ... |
| 135,000 | Stk. | Aug. 24 | 10 | 5% | Sheffield A | 223—224 | 97—99 | ... |
| 209,984 | ,, | ,, | 10 | 5% | Do. B | 222—224 | 97—99 | ... |
| 525,500 | ,, | ,, | 10 | 5% | Do. C | 220—222 | 97—99 | ... |
| 133,201 | Stk. | Sept. 15 | 4 | 4% | Shrewsbury 5 p.c. | .. | .. | ... |
| 90,000 | 10 | Nov. 2 | 9 | 7% | South African | 10¼—11¼ | 7—9 | ... |
| 6,609,895 | Stk. | July 27 | 5/4/0 | 5% | South Met. Ord. | 111—113 | 93¼—95½ | 93¼—94⅜ |
| 250,000 | ,, | July 13 | — | 5% | Do. Red. Pref. | .. | 95—97 | ... |
| 1,895,445 | ,, | ,, | 3 | 3% | Do. 3 p.c. Deb. | 72½—74½ | 59—62 | ... |
| 734,000 | ,, | Sept. 7 | — | 6½% | Do. 6½ p.c. Deb. | .. | 105—107 | 105⅛—106½ |
| 224,820 | ,, | Aug. 24 | 8½ | 8½% | South Shields Con. Stk. | 137—139 | 108—110 | ... |
| 1,087,795 | ,, | ,, | 6 | 6% | S'th Suburb'n Ord. 5 p.c. | 114—116 | 97—100 | 98⅛ |
| 298,337 | ,, | Dec. 29 | 5 | 5% | Do. 5 p.c. Deb. Stk. | 116—118 | 93—98* | ... |
| 647,740 | ,, | Nov. 2 | 5 | 7% | Southampton Ord. | 99—102 | 80—83 | ... |
| 121,275 | ,, | June 29 | 4 | 4% | Do. 4 p.c. Deb. Stk. | .. | 70—75 | ... |
| 250,000 | ,, | Aug. 24 | — | 21/8 | Swansea 7 p.c. Pref. Stk. | .. | 103—105 | ... |
| 200,000 | ,, | Dec. 29 | — | 20/2 | Do. 6½ p.c. Deb. Stk. | .. | 101—103* | ... |
| 120,000 | ,, | July 27 | — | 7½% | Tottenham and District (A 5 p.c. B 3½ p.c. 4 p.c. Deb.) | 135—138 | 112—117 | ... |
| 782,275 | ,, | ,, | 6 | 6% | | 115—117 | 100—103 | ... |
| 181,255 | ,, | Dec. 14 | 4 | 4% | | 87—89 | 75—80 | ... |
| 236,476 | Stk. | Aug. 24 | 5 | 2½% | Tynemouth 5 p.c. max. | 108¼—109 | 79—81 | ... |
| 30,000 | ,, | July 27 | 8½ | 72/6 | Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. | 151—156 | 111—115 | ... |
| 455,636 | ,, | ,, | 6½ | 57/6 | Do. B 3½ p.c. | 129—134 | 95—100 | ... |
| 108,075 | ,, | ,, | — | 50/9 | Do. C. | .. | 87—92 | ... |
| 140,865 | ,, | ,, | — | 50/9 | New Ordinary | .. | 87—92 | ... |
| 352,000 | ,, | ,, | 6½ | 53/9 | Wimbledon 5 p.c. | 117—122 | 95—100 | ... |
| 98,000 | ,, | ,, | 6½ | 58/9 | Epsom 5 p.c. | 121—126 | 95—100 | ... |
| 88,416 | ,, | Dec. 29 | 3 | 3% | 3 p.c Deb. Stk. | 66—69 | 56—59* | ... |

* Ex Div.

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**Dewsbury's Deficit.**—The annual accounts of the Dewsbury Corporation undertaking, issued last week, show a loss of £31,532 on the gas-works, making a total deficit at the end of March last of £52,590. The water department had a deficiency of £5275; and in both cases the unsatisfactory results are attributed to the industrial slump and reduced consumption of the commodities.

**Manchester Gas to be Cheaper.**—A substantial reduction in the price of Manchester gas has been notified by Sir W. Kay, the Chairman of the Gas Committee. This will be the third reduction made since gas reached its top price; the previous concessions being 3d. and 4d. per 1000 c.ft. The amount of the new reduction has not yet been definitely fixed; but it will date from Dec. 31.

**Rates and Wages at Leeds.**—Pronounced hopes of a further reduction in Leeds rates, on the next local budget, are based on lower Corporation expenditure expected as a result of wages reductions in the municipal departments. In the gas department 90 p.ct. of the labourers have been reduced by 20s. 3d. per week. In addition, most grades of skilled and semi-skilled workmen have had reductions since August of last year.

**Belfast's Record Gas Output.**—It is reported that for the week ended Dec. 20 the Belfast Gas-Works created a record in output, that amounted to 88,089,000 c.ft., as against 80,812,000 c.ft. for the corresponding week in the previous year—an increase of 9 p.ct. The maximum day's output had also been increased from 13,275,000 c.ft. to 13,773,000 c.ft.—the latter figure being the output on Dec. 20.

**Early Gas Lighting in Stockton.**—In his "Heavisides' Almanac" for 1923, Mr. Michael Heavisides, of Stockton, reproduces an interesting document relating to gas lighting in the town nearly a hundred years ago. It bears date Aug. 23, 1823, and sets out the "scales of prices per annum" and rules and directions for lighting, extinguishing, and payment. A double jet, cockspur, or batswing burner regulated the scale, which progressed at intervals of one hour; while the argand burner was given a special section and a higher rate of charges, as befitting the last word in gas lighting. In those days the Gas Light Company accepted no risks. Lights had to be taken for not less than a year; and rates were collected half-yearly, in advance.

**Gas Fatality at Islington.**—An inquest was opened and adjourned at Islington on the body of Samuel Howard, aged 74, of Wolverhampton. Mrs. Lillie said the deceased (her father) and his wife came to visit her last Saturday week. About 10 p.m. they retired to bed; and when she looked into their bedroom at 1 a.m. they were apparently sleeping. About 9 a.m. on Sunday, on taking them tea, she noticed a strong smell of gas, and found the tap of the bracket was not fully turned off. A doctor was immediately sent for, and Mr. and Mrs. Howard were removed to hospital, where Mr. Howard died early on Christmas morning. The tap of the gas-bracket was easily moved. Medical evidence was given that deceased died from poisoning by coal gas.

**Batley Gas-Works Finances.**—Mr. R. H. Duxbury (the Gas Engineer and Manager) and Mr. R. G. Rutter (the Borough Treasurer) have prepared a joint report on the financial position and prospects of the Batley Corporation gas undertaking. At the end of the last financial year there was an accumulated deficiency on revenue account of over £25,000; and subsequently, it is reported, there has been a decrease in the amount of gas consumed. It is suggested that a rate-in-aid, spread over a period of years, is inevitable, if the deficiency is to be liquidated, instead of remaining a drag on the undertaking and its fine new plant. It is further suggested that, despite the burden of deficit, ways and means should be found of reducing the selling price of gas, particularly for power users, in order to increase the consumption. The Finance and Gas Committees now have these proposals and the position generally under serious consideration.

**Request for a Further Reduction at Stafford.**—At a special meeting of the Stafford Town Council last week, Mr. Owen asked if the Gas Committee proposed to reduce the price of gas at the end of the December quarter, as had been promised. Alderman Young (the Chairman of the Gas Committee) pointed out that the price of gas was reduced last March, and again at the end of September. It would not be possible to consider any further reductions until the end of the financial year, because the Committee did not know what position they would be in financially. The slot-meter consumers derived the same benefit from the reductions which had been made as the quarterly consumers. Alderman Bedford remarked that it was strange that the demand for a further reduction in the price of gas should come from certain members of the Electricity Committee. He thought it was quite time that the Electricity Committee put their own house in order, and let the public get some benefit from the undertaking.

The firm of Messrs. Dent, Sons, and Co., has been registered as a private company, with a capital of £20,000, to carry on business as tar distillers, &c. The office is at Harrogate.

Some damage, though not to any very serious extent, was caused by an explosion on Dec. 22 to the water-gas plant and building of the Hebden Bridge and Mytholmroyd Gas Board. There was no personal injury.

Mrs. Sawyer, an old lady, the widow of the first proprietor of the "Wellingborough News," has been burned to death. It is presumed that she got out of bed for warmth at a gas-fire, and that her clothes got alight.

The Bolton Gas Committee are applying for a Government unemployment allowance to finance the laying of a new gas-main in Lostock Lane and Wingate Lane, so as to provide work for the unemployed of the town.

Seven houses in Anchor Road, Longton, were damaged last Friday afternoon by an explosion of gas, supposed to have been due to a leakage from a main. Some walls of the houses were blown out, and furniture smashed.

Proposals for the extension of the gas-works have been submitted to the Gas Committee of the Urban District Council of Prestatyn; and it has been decided to seek an interview with the Ministry of Health, with a view to securing, if possible, a Government subsidy.

As the result of the fusing of an electric wire, damage to the extent of about £1000 was done by fire which broke out at the timber store of Messrs. Mennell Bros., New Earswick, last week. Much timber was destroyed, half the building was lost, and electric driving gear was damaged.

At a meeting of the Wath (West Riding) and District Gas Board on Wednesday, it was reported that the consumption of gas during November in Wath, Bolton, Goldthorpe, and Thurnscoe exceeded 12,000,000 c.ft.—an increase on the consumption during the corresponding month of last year.

An eighteen-year-old footman, named Ronald Kirby, was found dead in a bathroom over a garage at Englefield Green. He had apparently been asphyxiated. The ventilating pipe of the geyser was dead against the wind, with the result that the fumes were blown back into the room. The geyser was in perfect order.

The Birmingham Gas Department will shortly make a start upon their Washwood Heath extension scheme, which has already been sanctioned by the City Council. Tenders are under consideration for the construction of two tanks for the holders. It is intended to develop this scheme by a very gradual process.

At last week's meeting of the Spenborough District Council—an authority comprising the three amalgamated townships of Cleckheaton, Liversedge, and Gomersal—it was reported that, following on the gas-works amalgamation in the area, the plant at the Gomersal works was no longer required. A Sub-Committee are considering means of its disposal.

Owing to a temporary failure of the electricity supply, St. Martin's Lane, London, suffered inconvenience for a few minutes one evening last week. At the Duke of York's Theatre, a portion only of the lighting ceased, and no inconvenience was felt. The Coliseum also was not materially affected, as most of the lighting is obtained from a private power plant.

The annual distribution of seasonable fare among the workers in the Newcastle Corporation City Lighting Department took place at the headquarters in Stowell Street on Dec. 23. Alderman Alexander Wilkie (the Chairman of the Lighting Committee) presided, and said that this was practically a new Corporation Department, and the Lighting Committee were very desirous to get the workers to feel that they were part and parcel of the Committee. On the call of Mr. Davison (the Superintendent), the various visitors were cordially thanked for their presence.

On Friday, Dec. 22, at the Town Hall, Leamington, the employees of Messrs. Sidney Flavel & Co., Ltd., were entertained by Mr. Percival W. Flavel, J.P., the Managing-Director. The Chairman's health was proposed by Mr. Thomas Sanderson, who has been associated with the firm for 53 years; and among several interesting reminiscences he referred to the fact that he had known three generations, and that Mr. Percival was the fifth Flavel in the business. He also noted in passing that the business had, in recent years, increased to four times the size. There were between 700 and 800 guests present. From 8 o'clock until 10 they all very much appreciated a splendid musical programme; and from that time till past midnight there was a most enjoyable dance.


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CAST-IRON TOWER SCRUBBERS, 5 ft. dia. by 40 ft. and 4 ft. 6 in. dia. by 18 ft. high.
WRT.-IRON TOWER SCRUBBER, 4 ft. 6 in. dia. by 36 ft. high.
LIVESEY WASHERS, 750,000 c.ft. per day and 100,000 c.ft. per day.
PURIFIERS. Set of four 25 ft. square, perfect.
PURIFIERS. Set of Two 12 ft. square, and Two 9 ft. square.
EXHAUSTERS and STEAM ENGINES. Three Sets 20,000 c.ft. per hour.
EXHAUSTERS and STEAM ENGINES. Two Sets 5000, and many sizes in Stock for Belt driving.
GASHOLDER and STEEL TANK, 172,000 c.ft. capacity, Column Guided.
GASHOLDER and STEEL TANK, 25,000 c.ft. capacity, Spiral Guided.
GASHOLDERS, 40,000 down to 5000 c.ft. capacity.
STATION METERS, 12,000, 5000, 3000 per hour.
TANKS, numerous stock all sizes.
PUMPS, Steam and Belt Driven.
Low Prices accepted for Quick Sale.
FIRTH BLAKELEY, SONS, & CO., LTD.,
CHURCH FENTON, YORKS.

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**FOR SALE—250,000 C.Ft. Capacity** GASHOLDER and STEEL TANK, Equal to New. First-Class Condition. Cheap, to save taking into stock.
Messrs. BATES & SONS, Gas Engineers, WIGSTON LANE, AYLESTONE, LEICESTER.

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**RAILWAY Tank Wagons for Dis-** posal, Rectangular and Cylindrical, specially suitable for Oil, Inflammable Liquids, also Acids.
Inquiries invited.
BROTHERTON & CO., LTD., LEEDS.

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**STEAM-BOILERS—All Sizes, Vertical,** Loco-type, Cornish, Portable, and Other Types of Boilers.
Apply GRANTHAM BOILER & CRANK CO., LTD., GRANTHAM.

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**GAS-WORKS.—Advertiser is prepared** to BUY a LARGE or SMALL PROPERTY for CASH. Preference given where there is room for Development.
Write giving Price and some Particulars, which will be treated in Confidence, to "GAS," c/o HORNCASTLE'S, 5, MOORGATE BUILDINGS, E.C. 2.

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**20,000 Yds. of Furnace Clinker** Wanted. Large or Small Supplies entertained. Material must be free from Coal, Coke, and Dust, and contain nothing under Half-Inch in size.
Offers to E. & E. ILES, Contractors, 54, NORTH ROAD, WIMBLEDON.


## CONTRACTS OPEN.

**BOROUGH OF MIDDLETON.**

CAST-IRON GAS-PIPES.

**THE Corporation invite Tenders for** the Supply of: (1) 400 Yds. of 4-in SOCKET and SPIGOT CAST-IRON TURNED and BORED GAS-PIPES, in 12-ft. lengths; and (2) SPECIALS for same.
Form of Tender, Specification, and Conditions may be obtained on Application to the Gas Engineer, Gas-Works, Townley Street, Middleton, Lancs.
Sealed Tenders, endorsed "Gas-Pipes Tender," must be Delivered to the undersigned not later than Wednesday, Jan. 10, 1923.
The Corporation do not bind themselves to accept the lowest or any Tender.
Dated this 29th day of December, 1922.
J. P. WALMSLEY,
Town Clerk.
Town Hall,
Middleton, Lancs.

*Continued on p. 48.*